POPULAR Computing WEEKLY

35p 11-17 August 1983 Vol 2 No 32

This Week

Aquarius review

Jeff Naylor looks for a new dawn as he takes the lid off the recently launched Mattel Aquarius See page 14

Software evaluator

David Kelly talks to Alison Maguire about her role as Sinclair's software evaluator on page 13

Spectrum colour

Mike Moscoff presents a simple utility routine which produces 'instant' colour changes See page 20

New releases

All the latest software games including *Beam Me Up Scotty* from Futura Software and *Space Hi Way* from Ameom See page 45

★ STAR GAME ★

Sunfell on 16K Spectrum. See page 10.

News Desk

Dragon disc drives delayed

DRAGON'S much delayed 5¼ inch disc drives are expected to reach the shops by the beginning of September

Originally the disc system was scheduled for launch in May, at the same time as the release of the OS9 operating system Difficulties with development of the OS9 implementation on the Dragon machines has meant that the company has had to go ahead with development of its own disc operating system to run with the Canon drives

Memory limitations have also meant that the OS9 system is not practical for use with the 32K Dragon Instead of offering an upgrade to 64K to run with OS9 discs Dragon will now provide the option of running its own discs with the Dragon 32

The OS9 operating system is now scheduled to be launched at the beginning of October, together with the 64K machine

OS9 was eventually im

Continued on page 5

Chess wizard behind new micro

by David Kelly

DAVID Levy, one time Olympic chess player and now a computer software writer is the man behind the launch of a new range of home computers

A new company, Elan Computers, will launch the machines — which are claimed to feature advanced sound and graphics handling — in mid-September for sale in early 1984

The new company is a joint venture between David Levy's company, Intelligent Software who will design and develop the Elan computer, and Dotnco, the Hong Kong electronics manufacturer

David Levy, a former Scottish Olympic chess player, became interested in chess computers in the mid-1960s, and is famous for his bet that no computer would beat him within ten years — a challenge he won

Continued on page 5

David Levy computer chess wizard and the man behind Elan Computers

Classified

Continued on page 40

★ ★ WIN A LYNX — SEE PAGE 37 ★ ★


MY NAME IS DIAMOND, DAN DIAMOND I'M A PRIVATE COP. I WORK THE BIG APPLE A SEETHING METROPOLIS FILLED WITH HUMAN MISERY AND CHINESE TAKEAWAYS.
NORMALLY I ONLY DO ROUTINE DIVORCE CASES BUT WHEN SHE WALKED INTO MY OFFICE I FOUND MYSELF INOLVED IN A CASE SO STRANGE THAT
IT MADE THE BIG SLEEP LOOK LIKE A CAT NAP...
Salamander SOFTWARE
PRIVATE DETECTIVE
PRIVATE DETECTIVE DISAPPEARS
Police are baffled by the disappearance of Dan Diamond. He was last seen approaching the eerie edifice known as Franklin's Tomb, but the authorities are completely unable to find any trace of him. Citizens are asked to report any information relating to his disappearance immediately. For further details, buy FRANKLINS TOMB a new adventure game for the DRAGON 32 and 48K ORIC 1. This adventure comes complete with a 24 page illustrated Case File £9.95 from BOOTS SPECTRUM COMPUTERS FOR ALL WEEK and all other purveyors
NEWS
HUNT WINS GRAND PRIX
At yesterday's Monaco Grand Prix, a hunting party strayed onto the track at the climax of the race. Cars were halted as the hounds rampaged around the circuit. "The whole place has gone to the dogs," one driver was reported as saying. The race was restarted, and drivers battled bitterly around the course before the Hunt thundered past the finishing line to take the chequered flag (it hasn't been seen since)
PLAYER WINS OPEN
Eagle eyed spectators were privileged to see
2 DEAD IN EVEREST TRAGEDY
The Everest Expedition ended in tragedy yesterday as Carl and plunged down a cre to a grisly death the expedition was quoted as
BANANA DICTATOR SLIPS UP
COLD WAR XARG ESCAPE
Thousands dead in Ice Storm
Muduras the

POPULAR Computing WEEKLY

11-17 August 1983 Vol 2 No 32

SUNSHINE

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12-13 Little Newport Street
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Telephone **01-734 1061**

Published by Sunshine Publications Ltd.

Typesetting, origination and printing by Chesham Press, Chesham, Bucks

Distributed by S M Distribution London SW9 01 274 8611 Telex 261643

Subscriptions
You can have *Popular Computing Weekly* sent to your home

UK Addresses
26 issues **£9.95**
52 issues **£18.95**

Overseas Addresses
26 issues **£18.70**
52 issues **£37.40**

How to submit articles
Articles which are submitted for publication should not be more than 3 000 words long. The articles and any accompanying programs, should be original. It is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted.

All submissions should be typed and a double space should be left between each line. Please leave wide margins.

Programs should whenever possible be computer printed.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your own program returned you must include a stamped addressed envelope.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish, although we will always try our best to make sure programs work.

This Week

Editorial

The scenario of *Wargames*, a new film which opened in London last week, seems unlikely at first glance.

A teenager taps into the US defence computer and inadvertently starts off World War II — ridiculous, isn't it?

But then you start thinking about all the different tricks young programmers have pulled off in the past and suddenly the film doesn't seem funny any more.

Changing school marks is the very least that these computer kids can now achieve. They are far more likely to break into some large corporation's computer and wreak havoc with its mailing lists or distribution system, just for fun.

Defence computers, of course, are much more securely guarded. Passwords are changed continuously, random checks are made, even the locations are kept secret.

But, there is no such thing as a completely secure system. Whatever tricks and ruses a programmer uses to protect a particular program, there is always another programmer somewhere who can figure out how to get round them.

Mind you, the computer kids who get caught aren't the ones who worry me. I am far more worried about the ones who don't get caught.

Our new address

★ *Popular Computing Weekly* has moved. We are now based in new offices, just five minutes walk away from our old Whitcomb Street home. Our new address is
Popular Computing Weekly
12-13 Little Newport Street
London WC2R 3LD

We're No. 1 on everyone's list!

The Melbourne House Best Sellers
An entire range of computer books and software

Apple hits the Microprofessor II

APPLE is claiming to have successfully taken legal action against Sirtel (UK) to halt sales of the Multitech Microprofessor II computer

The American manufacturer claims that the Rom of the Apple-compatible Microprofessor infringes copyright and patents held by Apple for its IIe computer

On July 27 Apple won an interlocutory injunction restraining Sirtel from continuing to import and sell the Taiwan-manufactured Microprofessor

The injunction will stay in force until a full trial is heard probably in the Autumn

Apple (UK)'s managing director Peter Cobb said "We are not prepared to tolerate any form of illegal mutation of Apple products

The terms of the restraining order also prohibit Sirtel from returning the existing stocks of Microprofessors to Multitech in Taiwan and also allows Apple to examine any future Multitech products to determine if they could infringe Apple's rights

The Spectrum Retail chain which stocks the Microprofessor has recalled all stocks from its dealers and is now pondering what to do with them

Another group — gosh!

GOSH — the Group of Software Houses — is a new body in the micro world, officially formed on August 1

Set up by Mike Johnston, organiser of the ZX Microfairs GOSH plans to act as a governing body for the software community to develop and maintain standards for customers and dealers

The idea is that the group will police itself making sure that software produced by its members is up to scratch and giving the customer some sort of guarantee against being ripped-off

From an industry standpoint GOSH will campaign in the interests of its members — over such issues as copyright piracy and trading standards

The fee for membership of GOSH has been fixed at £500 per year Said Mike "This may seem a high price but if a company is seriously in business than it must see that there is a need for a group to represent the interests of the software houses

Mike Johnston, secretary of GOSH.

Membership at present includes Virgin Games, Quicksilva, Bug-Byte New Generation Salamander and Silversoft The steering committee elected to get GOSH off the ground includes Mike Johnston (Secretary) Nick Alexander (Chairman, Virgin) and Rod Cousins (Vice-chairman Quicksilva)

GOSH is affiliated to the Computer Trade Association Software companies interested in joining should contact Mike at 71 Park Lane, Tottenham London N17

● The Computer Trade Association has held a series of meetings with John Butcher MP Under-secretary at the Department of Trade to discuss matters of concern to the micro trade — including piracy

Dragon drives

Continued from page 1

plemented on the Dragon controller by Ken Kaplin president of Microware (US owners of the OS9 system), and was delivered and demonstrated to Dragon in late July

The plan now is to launch the Dragon 64 OS9 and a range of compatible software all at the same time in late September or early October

Software in the package deal presented to Dragon Data includes *Dynacalc* the OS9 *Visicalc* equivalent licensed from Compusense and *Record Management System* a kind of Data Base manager licensed from Washington Computer Services

Chess wizard

Continued from page 1

A well known chess author his company formed with fellow chess writer Kevin O Connell — Intelligent Software — developed the *Sci sys* chess program and the software for the Mark 5 Chess Champion — the dedicated chess machine which became the world micro chess champion Most recent of Intelligent Software's products is the *Cyrus IS Chess* package sold by Sinclair for the Spectrum machine

Elan Computers was formed in November 1982 Originally called Samurai Computers, the company was compelled to change its name two months ago because of an existing company Micro Networks selling a 16-bit £3 000 Hitachi business system under a Samurai label

Few details are available on the forthcoming Elan nee Samurai computer The machine is claimed to represent the first of a new generation of home computers Commented Kevin O Connell "I have absolutely nothing to say No information will be released until we are 100 percent ready I'm afraid I'm going to continue to stone wall you

Mechanical beasts show their paces in Hove

ORGANISERS of the Living With Robots *exhibition at the Engineerium in Hove believe it to be the first event of its type in the world*

The museum's display of robots includes every conceivable type from heavy duty industrial units to the likes of K9 from the Doctor Who BBC tv series

The exhibition aims to show the increasing importance of such mechanical beasts

Living With Robots was *opened to the public last week by Patrick Moore and is expected to continue until the end of the year*

The British Engineerium is off Nevill Road Hove, East Sussex

Sierra buy world rights

IN what is probably the largest single deal so far Sierra On-line the Californian computer games publisher has paid $1m up-front as a royalty advance to Canada's largest developer of software — Sydney Development Corporation The agreement gives Sierra the world home computer rights to a series of titles using the Johnny Hart cartoon characters *B C* and *Wizzard of Id*

At least eight titles will be developed over the next year and a half for the Coleco Atari Commodore 64 and Apple machines. Two titles — *Quest for Tires* and *Wiztype* — will be out in the US by Christmas

ARE YOU OUT OF THIS WORLD?

SOFTWARE PROGRAM WRITERS

SILVERSOFT want to hear from you...

We are looking for out of this world, original, creative arcade action games utilising cosmic graphics written for any of the popular range of home computers.

If you think the games you have invented would challenge other space travellers contact:
Dougie Born at SILVERSOFT LIMITED, now,
London House 271/273 King Street London W6
Telephone: 01-748 4125.

SILVERSOFT

Awful Automsta?

With reference to the Letters page this week (*PCW* 14-20 July) I like the *Losers* cartoons though I liked *Citizen Pain* better. Keep some cartoon anyway besides those awful Automata advertisements which should be forcibly suppressed

P Devereau
2 Worley Road
St Albans
Herts AL3 5NS

Awful Automata advertisements? Love them or loathe them, you certainly can't ignore them. Besides, I'm a Marx brothers fan

Space odyseey

In a recent edition of your magazine (*PCW* 28 July-3 August), the editorial column featured an item about micros and humour. You stated that *HAL* from *2001* is a dig at *IBM* (*HAL* being one letter ahead of *IBM*) — this is not so!

If you read either *The Lost Worlds of 2001* or *2010 Odyssey 2* you will discover in the former "Every week some bright spark notices that *HAL* is one letter ahead of *IBM* and surmises that I (Arthur C Clarke) was taking a dig at this noble institution. *HAL* in fact stands for *Heuristically* programmed *AL*gorithmic computer." In the latter there is a conversation between two crew members of the space ship *Lebedev* (sent to rescue *HAL* in the *Discovery*) to the effect that many of *HAL*'s designers came from *IBM* and this was just a meaningless coincidence (this is probably not completely accurate as it was done from memory but it conveys the general idea).

Apart from this it is a very good magazine and I will continue to read it

Graham Marsden
20 Apsley Road
Clifton
Bristol BS8 2SP

Just a meaningless coincidence, huh? Perhaps one of our readers would like to send in a program to demonstrate the odds against this coincidence.

Of course there is more than one explanation for the origins of HAL's name, but I confess that I prefer the IBM story to "Heuristically programmed ALgorithmic computer".

An easier way

Regarding the 'Function Repeat' program for the Vic20 by Tony Dickens in *PCW* Vol 2 No 29. He, and other Vic owners might like to know that there is an easier way to make all the keys repeat. All you need to do is *Poke* location 650 with 128 — to return to normal *Poke* 650 with 0.

Locations 651 and 652 are the repeat delay counter and the repeat speed counter respectively

M Le-Vallois
31 Seedhill Road
Paisley PA1 1SB

Bssicelly better?

Whilst idly thumbing through a software catalogue recently, it occurred to me that the programs that I play most often — ie those which best retain their interest for me — are written in Basic rather than in machine code.

This puzzled me to begin with — everyone knows that machine code programs are harder to write so you'd think that they should be superior. But, I have come to the conclusion that the ease of writing Basic enables software writers (or some of them!) to exert their imagination and write complex and effective programs.

On the other hand machine code writers confine themselves largely to arcade-style graphics games which require little thought (once you have the knack) and apparently little imagination with endless variants of *Space Invaders* and *Pacman*. The programming may be sloppy, but the defects are largely overcome by sheer machine code speed. The sole function of such games seems to be to prove that a 1.2 MHz CPU chip is faster than your reflexes, which ultimately becomes boring.

One such program that I bought recently is a very pretty arcade game but after stripping out the pretty background, all that you are left with is two player-missile sprites firing at your Space-Invaders cannon. It would be trivial (as well as slower) in Basic. On the other hand, the Basic-written graphics adventures by companies such as Epyx are sophisticated and brilliant!

Perhaps the best games will be written when good Basic compilers are freely available. Meanwhile I shall continue to compromise with bits of machine code inserted into my Basic programs.

What do other readers think?

John F White
22 Starling Close
Woosehill
Wokingham
Berks RG11 2YY

Error list

Ian Beardsmore's comments to a reader from Manchester regarding *Index List* (*PCW* 7-13 July) hit a sore point.

The problem is often one that in reading a technical article spread over a few weeks or months errors printed in the early issues come up weeks, if not months, later, perhaps in the letters column or worse in some obscure corner of the publication. To combat this problem in electronics it is best to wait until the series has finished before evaluating the overall project. At least with software listings you cannot "destroy components" but you can waste a lot of time.

Machine code articles are the main problem, one missing character or even an inserted space, and bang goes a lot of effort. The iNGROUP (the shorthand name for the Independent Newbrain User Group) is compiling a list of articles on Z80/8080 etc. related machine code and each month a summary of all references to the Newbrain in the press is made. For an annual membership fee of £6.50 you can gain access to this summary on cassette or hardcopy by supplying a SAE. Some of your readers may find it of interest and worth joining the iNGROUP for this service.

Looking through old copies of *Personal Computer World*, I discovered a series by Mike Banahan (vintage 79) which had it been readable, would have been most helpful for Newbrain owners. The series which started in '78 was real pioneering and it must have inspired many machine code programmers. perhaps what is needed is a way of keeping in touch with people! I look forward to the exciting and satellite people providing the alternative links to compete head on with the two current monopolies.

Anthony D Hodge
Independent Newbrain User Group
15 St Johns Court
Wakefield WF1 2RY

Mini-Pacman

The following alterations are necessary to allow *Mini Pacman* to run on the unexpanded Vic20

```
65 POKE 52,28 POKE 56,28
318 IF PEEK (197) = 64 THEN 460
320 K = PEEK (197) MO = 0
325 IF K = 9 THEN MO = -22
330 IF K = 29 THEN MO = 22
335 IF K  17 THEN MO = - 1
340 IF K = 18 THEN MO = 1
    Then delete line 920
```

PS Thanks for the compliment, but I am not the R Watson who wrote the *Mini Pacman* program! My program was the *Screen Colour* machine code program published several weeks earlier. Anyway the above alterations should make the program work

Robert L Watson
43 Derwent Road
Athersley South
Barnsley
S Yorkshire S71 3QR

TRS80 users club

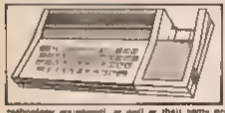
I am writing to ask if any TRS80 colour computer owners wish to form a sort of users club, designed to make the most out of this highly-versatile machine (ie, send tips, hints listings etc to each other).

Anyone who is interested should write to me with details of his computer (4K 16K extended Basic, etc)

Paul Armitage
23 Gedding Road
Drinkstone
Bury St Edmunds
Suffolk

HOME COMPUTERS

20K AQUARIUS



AQUARIUS. The brand new Aquarius Personal Computer is part of Mattel Electronics latest developments in advanced technology and offers full sound computing facilities as well as keyboard entry play using a very wide range of plug in cartridges. Since Aquarius is a Mattel Electronics product it naturally by the company's basic experience of achieving high technology equipment as well as their long programming expert so which is based from the advanced games which been produced for the Intellivision. Aquarius costs £99 and comes with microprocessor, built in. It is so simple to use that you'll be writing your first programs within minutes of getting the home out of its box! You can even record the programs on your own cassette available at speed so you can use them again at a later time! Mind you, keyboard demonstration says nothing about the Aquarius.

A POWERFUL MACHINE. For all its simplicity, it is also very sophisticated. It has a Z80A processor and it comes with 8K of built in ROM and 20K of RAM, expandable to 52K. It has a display of 40 x 24 alphanumeric and a graphic resolution of 320 x 192 with a total character set of 256 including the complete ASCII set with upper and lower case letters, numbers and special graphic symbols! The keyboard has 49 full stroke moving keys unlike some of the cheaper machines which have membrane keyboards. The size of the machine producing any of the additional peripherals is 13 x 8" x 2.

PERIPHERALS. It is worth bear in mind the possibilities of your Aquarius as all the peripherals plug straight into each machine. You can add a Printer, a Modem, a Data Recorder, Mini Expander and speed loads. All of the peripherals are very easy to install and work in every they're been to use. But the beer even of all is they're been to offered.

CPM OPERATING CAPABILITY. The Aquarius is capable of being available in 52K RAM and later in 1983 a disk drive will be available for it, with the commercial CPM business operating system. This will make you beam to one of the largest software libraries in the world, with literally hundreds of programs available for you to use.

CARTRIDGES. Various sophisticated programs will be launched on plug in cartridges such as a Visicalc type spreadsheet and a speed processor. In addition there will be dozens of games and utilities and alternative languages such as Logo which combined with the built in mnemonic hand gives an unbiased appreciation of high quality programming ability.

£99

20K MATTEL AQUARIUS – £99 + VAT = £99

ATARI 400/800

NEW LOW PRICES

ATARI 400/800. With the Atari Personal Computer you can play the ultimate in TV games, teach yourself new subjects or skills, balance budgets and even write your own computer programs in Basic.

SPECIFICATIONS. Both the Atari 400 and 800 can display in up to 16 colours with with 16 intensities. They have four independent sound synthesizers for music tunes/game sounds giving four octaves with variable volume and tone control on your TV / monitor. The display graphics are of a [illegible] lists led resolution of 320 x 192 comprising 24 lines of 40 characters. Atari computers have a sophisticated 48K ROM operating system. In addition the standard Atari 400 (£129) comes with 16K of RAM and the expanded version with 48K (£278). The Atari 800 (£279) comes with 48K as standard. Both the 400 and 800 are now neatly set with a FREE £40 Basic Programming Kit, which includes the Basic Programming Cartridge as well as a 120 page Basic Reference Manual and the 184 page Self Teach manual by Bill Carris entitled Inside Atari Basic so you can begin programming straight away without buying any extras. Even a sound plug is supplied!

OVER 500 PROGRAMS AVAILABLE. The Atari computers are supported by well over 500 programs available for your use, a larger selection than you will find on any other home computer. The wide bandwidth pure Atari very artistic of the computer. Just fill in the coupon and we will be pleased to send you a full price list with a very detailed of our range of software available for entertainment, home education, programming and home utilities use. We think you'll agree what we say: it's quite impressive.

100 FREE PROGRAMS FROM SILICA SHOP. If you buy your Atari Home Computer from Silica Shop, you will receive a FREE presentation pack of 8 cassettes containing 100 programs, including games utilities and demonstrations. A 16 page booklet giving full details of all these programs is available on request. If you have already purchased your computer elsewhere you can buy the set of 8 cassettes for £30. What's more Silica Shop offer a two year guarantee on all computers as well as a FREE joystick. This was up to a price of £60 but it has been so matched by any of our competitors.

ATARI 400 16K – £112.17 + VAT = £129
ATARI 400 48K – £154.78 + VAT = £178
ATARI 800 48K – £242.60 + VAT = £279

£129

VIDEO GAMES

COLECOVISION

THE SYSTEM. The CBS Colecovision offers new standards in video game play. The excellent graphics are well manufactured with arcade titles such as Zaxxon, Lady Bug, Carl Wizard of War, Carnival, Mouse Trap and the special Smurfs. The console comes supplied with a three screen reduced quality version of DONKEY KONG. Perhaps the other companies with any prestigious range of cartridges for Colecovision go further enjoyed the open range of quality titles available for the non television games specialist.

THE CONSOLE. The CBS Colecovision video games system has advanced technology which produces superlative graphics rose action and excellent sound effects. The styling of the console and hand controllers has been carefully considered, the console is designed to complement modern hi tech equipment and has some features for easy operation. The hand controllers allow fingertip control via a 8 direction joystick and feature 2 independent fire buttons. The push button keypad is used for game selection and for game options of which some cartridges. The hand controllers are detachable and connected to six lots of telephone cell leads, serving rarely seen in the console which not in use.

ATARI EXPANSION MODULE. The Atari converter specially allows Atari VCS software cartridges to be played on the Colecovision, specially allowing owners the freedom to purchase from the extensive range of Atari compatible software. It also means that existing Atari owners can buy the CBS Colecovision games system without disrupting their software library. Silica Shop offer part exchange facility so if you want to upgrade.

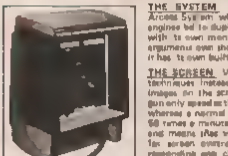
TURBO EXPANSION MODULE. The Turbo Driver Expansion specially allows you to actually drive the vehicle that appears on your TV screen. The specially compatible car steer by which dashboard and accompanying sound. One hand controller is mounted on the dashboard to provide a part change unit. The module comes complete with a Turbo Driver cartridge the first of several cartridges to make use of the module which simulates all the action of sitting in the driving seat. This facility is unique to CBS Colecovision.

HOME COMPUTER EXPANSION MODULE. The Home Computer Module scheduled for late 1983, allows conversion of the games system into a sophisticated home Computer. This flexibility of design is an important feature of the CBS Colecovision System.

£147

COLECOVISION £127.82 + VAT = £147

VECTREX



THE SYSTEM. Vectrex is a totally unique home Arcade System which has been exciting very designed and engineered to duplicate any arcade game play. Complete with its own monitor display Vectrex won't cause any arguments over the use of the family's television likewise it has its own built in screen.

THE SCREEN. Vectrex does not use standard display techniques. Instead it uses vector scanning so based the images on the screen. With this scanning necessity the gun only speed at the area of the screen been has changed whereas a normal TV is transmits the ENTIRE screen 50 times a minute. It is this that gives Vectrex its speed and means that very little computer memory is required for screen control and the results provide very fast responding and clear images. These Vector Graphics are used in several arcade games such as Asteroids and Battlezone to give you incredibly high resolution and quality. Vectrex brings all of the fast the arcade right into your living room. The Vectrex screen is opaque so displaying 80 colours by 48 lines which is significant to the extensive developments planned for the system.

EXCITING SOUNDS AND ELECTRONICS. Vectrex has an advanced microprocessor with arcade speed and sound and exciting effects then many speed video games systems.

REAL ARCADE CONTROLS. Vectrex has a unique control panel similar to those used in many real arcade games with 4 cassette action buttons and a full 360° self centre joystick. The control panel has a 4 foot detachable cord for maximum player freedom.

REAL ARCADE GRAPHICS. Vectrex has its own 9 inch vertical screen and unlike a conventional TV screen uses advanced display technology to achieve brilliant high resolution imagery and superb game play never before possible. The Vectrex display provides special effects like such as 3 D rotation and shooting in and out which a regular TV cannot match. Using a black and white monitor each Vectrex game comes switched with its own specified plastic screen overlay to add to the excitement of game play. The range of Vectrex cartridges (£19.95 each) gives a wide selection of arcade games such as Berzerk, Scramble, Rip Off, Star Hawk, Armor Attack. Vectrex comes complete with a fast speed "Mineovers" game built into memory.

£129

VECTREX – £112.17 + VAT = £129.00

WHO ARE SILICA SHOP?

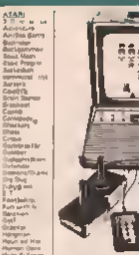
[illegible]

01-309 1111

SILICA SHOP

SILICA SHOP LIMITED Dept ZPCWK 0883
1-4 The Mews, Hatherley Road, Sidcup, Kent, DA14 4DX
Telephone: 01 309 1111 or 01 301 1111

VIDEO GAMES



ATARI

ATARI VCS (2600) – THE NO.1 BRAND LEADER IN THE U.K.

ATARI. The Atari Video Computer System known as the Atari VCS or the 2600 has now become the T.V. game brand leader in the U.K. there are now 750,000 owners of the VCS with some no a range of over 200 different plug in cartridges each having a multitude of different variations and difficulty levels. Every system comes complete with the main console two individual joystick controllers a pair of paddle controllers serial splitter mains adaptor a 27 game Combat cartridge and a **FREE** 112 game **SPACE INVADERS** cartridge. The console also incorporates special circuits designed to protect your T.V. set.

SECONDHAND GAMES. We currently have several secondhand Atari VCS units in stock which we are selling for only £39 inc VAT! This price includes the Console with Combat Cartridge and all the accessories as well as a 12 month guarantee. We and have stocks of several secondhand cartridges many at half price (all with 12 month guarantee). We will normally buy back secondhand units and cartridges at ¼ of our normal selling price.

£39

EXTENSIVE CARTRIDGE RANGE. The Atari VCS is so popular that it boasts an Atari's own cartridges there are over 150 compatible cartridges produced by at least 6 dozen different third party manufacturers. Silica Shop has one of the largest cartridge selections available in the U.K. Our range of 200 (printed either side of this address) includes items in stock now as well as many of the new releases for Atari. (Ask for details).

SILICA ATARI CLUB. Silica Shop has over 20,000 Atari VCS club members registered on our computer. As a specialist company we are able to obtain advance information about new developments and send detailed catalogues to all of our club members enabling them to evaluate new products before they buy. This is a totally FREE service to receive your copies complete the coupon needed.

SERVICE CENTRE. Atari International (UK) Inc has recently appointed Silica Shop as an authorised Atari Service Centre. This means that we can now service your Atari VCS or 400/800 (please quote if applicable) whether or not you purchased it from us.

VCS COMPUTER KEYBOARD. A keyboard will soon be launched to convert the VCS into a fully programmable home computer. For further details join our club by completing the coupon below. We will then let you know when further information is available.

STARPATH SUPERCHARGER. The supercharger plugs into the cartridge socket of your VCS and expands its RAM almost 50 fold from 128 to 6,272 bytes. This increased memory need vivid high resolution graphics possibilities and significant lengthen the game playing time. Supercharger has a range of multi-load games (at £19.95 here) these offer the facility to play a game in several (six or) parts (great for adventures) the next section being loaded when you have completed the area you are thus enhancing the game play. For further information please complete the coupon below.

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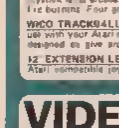
We stock a wide range of accessories for the Atari VCS and 400/800 home computers. The same accessories can be used on the Commodore VIC range of computers. The VIC and can also be used with the Texas Instruments computers on purchasing a special adaptor. To give you an idea of the range available just take a look at the following list.

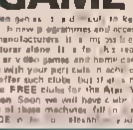


LE STICK. A memory filled joystick specially made for one handed operation with thumb fire button.

QUICK SHOT. This joystick features a contoured handle grip thumb trigger and optional hand fire button. It is supplied with 4 sure foot suction grips.

STARFIGHTER. Neat and compact with a small direction stick. Metal interior for added strength.

VIDEO COMMAND. With a tapered handle this joystick is for one handed use. It has a direction control which is similar to a jet fighter joystick.



WICO RED BALL: An angled type joystick with a red ball module it features 2 fire buttons handpads one at the base and one on the stick it comes supplied with 4 grip pads for sealed table top use.

WICO STRAIGHT STICK: The main feature of this joystick is its arcade style bat handle grip. It also has 2 fire buttons. Four grip bases included for table top use.

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12 EXTENSION LEAD. A 12 metre lead for Atari and Atari compatible joysticks for greater play freedom.

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MATTEL INTELLIVISION. The Mattel games unit is a cartridge operated TV game which uses 3-D graphics quality for only £98. Each cartridge comes with 2 over ays which fit over the console hand controller giving easy directions for game play. Using the console's centre disc objects can be moved accurately in 16 directions giving a realistic simulation of lifelike movement. From 1st September 1983 the Mattel Intellivision T.V. Games Console will supply with a **FREE VOICE SYNTHESIS MODULE** normally priced at £56. This unit creates high quality synthesised male and female voices as part of the game play on certain cartridges.

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Sunfall

A new game for 16K and 14K Spectrum by Jonathan Medhurst

Your mission is to provide sunny weather for all and keep the clouds and rain away. Unfortunately the clouds are bound to break through eventually.

This game is played on a screen that has 20 rows of green blocks. The idea is to slide these blocks left and right to let your yellow sun drop through the gaps.

But there is a catch — in the form of a cloud. You must prevent the cloud from falling to the bottom, or you will lose a life. There are also raindrops on the way down which you can pick up for extra points.

When you reach the bottom of the screen you are automatically returned to the top. After completing five screens you progress on to the next level which has fewer blocks, making it harder to prevent the cloud from reaching the bottom.

The original version of the game used a Basic routine to set up the 20 rows of blocks at random, but this took over 20 seconds to complete. To speed things up, I converted that part of the game into machine code, which is stored at address 32500 — the program will Run on both 16K and 48K Spectrums.

To start the program, type *Goto 3040*.

List of variables

breaks	Number of times left you can break a block
cx, cy	Co-ordinates for the cloud
drops	Number of times you have dropped from top to bottom
hi	Highest score so far
level	Number of the current level
score	Your score
suns	Number of suns left.
sx, sy	Co-ordinates for the sun
time	Delay before moving the rows at random
k$	Stores value of *Inkey$*
r$()	Stores 20 rows of 32 blocks (each block has two characters for colour control preceding it)
s$	Used to put a space in a row: s$ = Chr$16 + Chr$0 + space
a, b, c, z, s$	General purpose

```
1000 LET level=level+(level<23)+
23*(level>=23)  POKE 32830,level
*8+70  LET a=USR 32800  LET time
=0
1010 LET sx=2  LET cx=2, LET sy=
INT (RND*8)+3  LET cy=INT (20-RN
D*6)  LET r$(1,sy*3+1 TO sy*3+3)
=s$  LET r$(1,cy*3+1 TO cy*3+3)=
s$
1020 GO SUB 7000, PAINT "  L  ";
"  0  AND level<10),level,"  6  ",b
reaks," ", INK 6, BRIGHT 1,"****
"( TO suns), BRIGHT 0,TAB 1  PRI
NT AT 2,0  FOR a=1 TO 20  PRINT
r$(a)  NEXT  a
2000 PAINT AT cx,cy, INK 7,"G";A
T sx,sy, BRIGHT 1, INK 6,"&"
2010 LET i$=INKEY$  IF i$<>"" TH
EN LET time=0  IF i$="h  THEN PA
INT 00, FLASH 1,"HOLDING"  PAUSE
0  INPUT  ""
2030 IF i$="0" THEN IF sx<21 AND
breaks THEN PRINT AT sx+1,sy,  I
NK 0," "  LET breaks=breaks-1  P
RINT AT 0,26;breaks  LET r$(sx,s
y*3+1 TO sy*3+3)=s$
2032 IF i$<>"6" AND i$<>"0" THEN
LET time=time+1  IF time>15-lev
el THEN LET i$="6"  LET time=0
IF RND<.6 THEN LET i$="0"
2040 IF i$="5" THEN LET r$(sx-1)
=r$(sx-1,4 TO )+r$(sx-1, TO 3)
LET sy=sy-1+32*(NOT sy)  LET cy=
cy-1+32*(NOT cy)  IF sx<>cx THEN
LET r$(cx-1)=r$(cx-1,4 TO )+r$(
cx-1, TO 3)
2050 IF i$="8" THEN LET r$(sx-1)
=r$(sx-1,94 TO )+r$(sx-1, TO 93)
, LET sy=sy+1-32*(sy=31)  LET cy
=cy+1-32*(cy=31)  IF sx<>cx THEN
LET r$(cx-1)=r$(cx-1,94 TO )+r$
(cx-1, TO 93)
2060 IF i$="9" OR i$="0" THEN BE
EP .02,-10  PRINT AT sx,0,r$(sx-
1)  PRINT AT cx,0,r$(cx-1)
2070 IF ATTR (sx+1,sy)<>12 THEN
BEEP .01,30  PRINT AT sx,sy, INK
0," "  LET sx=sx+1  LET score=s
core+level+(level*8*(ATTR (sx,sy)
=13)  PRINT AT 0,7-LEN STR$ scor
e,score  IF sx<>22 THEN LET r$(s
x-1,sy*3+1 TO sy*3+3)=s$
2080 IF ATTR (cx+1,cy)<>12 THEN
BEEP .01,10  PRINT INK 0,AT cx,c
y," "  LET cx=cx+1  IF cx<>22 TH
EN LET r$(cx-1,cy*3+1 TO cy*3+3)
=s$
2090 IF sx<>22 AND cx<>22 THEN G
O TO 2000
2100 IF cx=22 THEN LET suns=suns
-1  IF suns=-1 THEN PRINT AT 2,0
,TAB 21,AT 10,10," ", FLASH 1, B
RIGHT 1,"GAME OVER", BRIGHT 0, F
LASH 0," ",AT 11,9;TAB 21  GO TO
9000
2110 IF cx=22 THEN BEEP .1,10  B
EEP .1,4  BEEP .1,0  GO TO 1010
2120 LET drops=drops+1  IF drops
=5 THEN LET drops=0  LET score=s
core+100*level  LET level=level+
1  GO SUB 6000  GO TO 1000
3130 BEEP .1,0  BEEP .1,4  BEEP
.1,10  LET sx=2  LET r$(sx-1,sy*
3+1 TO sy*3+3)=s$  GO TO 2000
3000 DATA "■",234,b,b,b,b,b,b,0
3010 DATA "&",0,16,40,68,68,68,0
0
3020 DATA "G",48,72,72,132,130,1
14,12,0
3030 DATA "*",16,84,68,264,66,84
,16,0
3040 INK 7  PAPER 1  BORDER 1  C
LEAR 32499  DIM r$(20,96)  PRINT
AT 10,8,"Hang on a second"
3050 FOR c=1 TO 4  READ a$  FOR
a=USR a$ TO USR a$+7  READ b  PO
KE a,b  NEXT a  NEXT c
3060 RANDOMIZE  LET hi=0  LET s
$=CHR$ 16+CHR$ 0+"
3070 DATA 1,127,3,42,76,92,17,6,
0,28,229,42,116,92,84,93,41,41,2
0,41,41,41,26,34,110,93,124,225,
054,28,48,6,17,5,140,24,12,204,6
0,46,8,17,0,32,24,3,17,4,144,54,
16,36,118,36,114,60,11,120,364,6
,32,204,201
3080 FOR a=32800 TO 32863  READ
b  POKE a,b  NEXT a
3090 PRINT AT 10,7,"Instructions
? y/n"  PAUSE 0  IF INKEY$="y"
THEN GO SUB 8000
3100 CLS
4000 LET drops=0  PRINT 00,"  Se
lect level of Play  1 to 6"
4010 PAUSE 0  LET i$=INKEY$  IF
i$<"1" OR i$>"6" THEN GO TO 4010
4020 INPUT ""  LET level=VAL i$
LET score=0  LET suns=4-INT ((l
evel-1)/2)  LET breaks=10-level
GO SUB 1000  IF score>hi THEN L
ET hi=score
4030 GO SUB 7000  GO TO 4000
8000 FOR a=80 TO 0 STEP -2  BEEP
.02,a  BEEP .02,a-10  NEXT a  R
ETURN
9000 FOR a=0 TO 80 STEP 2  BEEP
.02,a  BEEP .02,a-10  NEXT a  NE
XT a
7000 PRINT AT 0,0,"S 00000", AT 0
,7-LEN STR$ score,score,TAB 9,"H
 00000",AT 0,18-LEN STR$ hi,hi,
RETURN
8000 CLS  PRINT "SUNFALL"'''"© 1
983 by J.Medhurst"''''" This game
is played on a screenthat has 2
0 rows of green blocks", INK 4,"
■", INK 7," with gaps in them.
The aim of the game is to slide t
hese rows across to enable your
sun, ", INK 6,"9", INK 7," to dr
op from the top of the screen"
8010 PRINT "to the bottom throug
h the spacesin the blocks. There
is also a cloud, ", INK 3,"A",
 INK 7," which you must prevent
from dropping to the bottom, if
you don't you will loose a sun."
8020 PRINT " When you reach the
bottom you  are transported back
 to the top until you have done
five drops, after which you reci
eve 100  times the level numb
er in pointsand go onto the next
 level."
8030 GO SUB 9000  PRINT " For ea
ch row of blocks you movedown yo
u get the level number inpoints
and if there is a rain  drop,
, INK 0,"&", INK 7," in the the
gap the sun  drops through you r
eceive ten  times that number o
f points."
8040 PRINT " If you find that yo
u are unableto find a gap to dro
p through  then you can press t
he '0' key  and the block under
you will be disintegrated. You c
an only do  this a  small number
of times,  and the number you h
ave left is shown on the top row
 after the  letter '0'."
8050 PRINT " To move the rows le
ft and rightyou use the '5' and
 '8' keys  respectively, doing
so will movethe row the sun is i
n and the  cloud's row in the g
iven direc- tion. If this places
 either over a space then they wi
ll fall."
8060 GO SUB 9000  PRINT " The hi
gher the level the less  blocks
there are which makes it more di
fficult to stop the cloudreachin
g the bottom. To make  things
worse, after a set time, which g
ets smaller, or not mov- ing a r
ow, the rows move in a  rando
direction."
8070 PRINT " At any time you may
 press  'H'  which will hold the
game until a key is pressed. Wh
ilst you areplaying the top line
 of the  screen will show, fr
om left to  right  Your score, t
he highest  score, the level, th
e number of blocks you can blast
, and how  many suns you have l
eft. E.g."
8080 PRINT ""S 00495  H.04012  L
 04  8  4 ", INK 0,"***"' INK 7,"
 You will now be asked at which
level you wish to start on."
9000 PRINT #0,"Press any key to
continue."  PAUSE 0  BEEP .2,0
BEEP .10,-4  INPUT ""  CLS  RET
URN
```

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Sinclair's soft options

***David Kelly** talks to Alison Maguire, Sinclair's software evaluator*

Sinclair is showing signs of paying greater attention to software. Six months ago Alison Maguire was taken on to fill a new post — her brief: to sort out a more co-ordinated company approach to software.

It is an appropriate time for the move — a lot of the more exciting things happening at Sinclair depend heavily on software — the Microdrive and Rom cartridge adaptor to name but two.

In the past Sinclair has never produced its own software — instead choosing to adopt a very small number of software houses — such as Psion — to write material for it, which is then sold under a Sinclair label.

But the emphasis is changing at Sinclair, and Alison Maguire has been appointed specifically to develop Sinclair's software involvement — to select third party (independently produced) software to be bought in and sold under a Sinclair label.

Sinclair has never done and does not intend to develop its own software, she says. The sort of skills needed to produce good software are not the same as those to produce the hardware and I can see no point in establishing an in-house software development team which could become sluggish or lose its creative edge.

Over the last few months, Alison has been sifting her way through the mountain of software available from independent companies for the Spectrum.

"An awful lot of people don't know our role — we *do* publish software, and we *do* sometimes accept programs from individuals and smaller houses. I look for originality first and foremost — then good graphics and speed are important. We have a steady flow of software in to us — the problem is one of deciding which programs to chuck out.

With games you need a creative flair — it is almost indefinable what makes a good game — they either sparkle or not.

Games have not really been Alison's main worry — there are a great number of extremely good ones already available for the Spectrum. Her main priority in the last few months has been educational software. "I've been pretty unhappy with what I have seen on the market already. Most of the programs have either been written by educationalists with no knowledge of computers or *vice versa*.

"We have approached the field with some humility. Sinclair has now gone in with Macmillan Educational publishers and we will jointly arrange for the production of software based on their existing material — ten titles designed for use in primary education will appear in November.

In this arrangement — the first of a new kind for Sinclair — Sinclair will act purely as an agent, putting programmers and authors together.

The importance given to establishing a range of educational software titles is in part due to the Spectrum's failure to capture the major proportion of purchases for schools under the Department of Industry's grants scheme. Says Alison: "I'm actually pretty hopeful of the Spectrum in schools. Given the way the DoI's scheme is worked — with a discount based on a percentage of the micro's price — I don't find it at all surprising that the Acorn computer has dominated the project.

A worthwhile investment

"But most schools are only on their first computer now. When they come back for their second and third machines I am sure that they will be buying Spectrums. I don't know that we will ever take over from the BBC machine in schools, but I am very enthusiastic."

The other thing Sinclair will be doing in the educational field is taking the MEP software used in schools and selling it into the home market as a back-up.

Other software in the pipeline includes a number of utilities — an assembler monitor, compiler and graphics package.

On the business software side, Alison has yet to come upon what she wants — a fully integrated suite of packages.

"There are an awful lot of small businesses that would consider the Spectrum, with a suite of business software and a couple of microdrives, a worthwhile disposable investment — just to find out the potential of a business system."

As far as the Microdrive is concerned, Sinclair is leaving it pretty much to the individual independent software houses to make of it what they will. The Microdrive cartridges offer around 85K and are very secure — and Alison is convinced that software houses will see its potential.

Sinclair is currently making arrangements with existing software houses to put a few titles on Microdrive cartridge under the Sinclair banner. Psion's *Flight Simulation* and Melbourne House's *Penetrator* seem likely existing titles.

If a software house wants to put its material on Microdrive cartridge without the Sinclair banner then Sinclair will sell them blank cartridges in bulk. These can then be recorded using the Spectrum and Microdrive itself — not as laborious as it sounds — the recording is extremely fast.

Some software houses have already had a Microdrive for a couple of months now and many more should have received one by the time this article is published.

Rom software is also high on Alison's agenda. There are now enough machines sold that it is worthwhile trying a Rom cartridge interface and software on the Spectrum. I have arranged for a number of titles to be available at the same time as the ZX Interface 2 — the Rom port — is launched in time for Christmas.

One of the intentions Sinclair Research has is to slightly shift its emphasis towards the software side. "We are interested in building firm relationships with a small number of existing software houses — just as we have with Psion. Moving towards taking a greater part in software development — without setting up our own production facility.

"These few companies, I hope will get involved at a much earlier stage in the design of new Sinclair products. The problem is finding the right people to work with.

"We do intend to be much more forward with our new products and make information available to this small number of companies — in fact these suppliers are already privy to some details of our new products.

"One of the factors that has decided us to make this move is that any new product — any successor to the Spectrum — will be more complex than the existing computers and this will also mean software of increased complexity.

Sinclair's new machine will be capable of professional application. The word is out that Sinclair is looking for business software and it is no accident that Alison's career before joining Sinclair has been at that end of the market — first as a programmer and then systems analyst.

The new 'professional' machine — so called because it will be pitched between the home and business sectors — could make its debut at the end of this year — but it's likely to be early 1984.

Prices suggested are around £300 and it is intended to be a competitor for the IBM PC and Osbourne machines! ■

An impartial view

***Jeff Naylor** turns ster gazer as he delves inside the workings of the Mattel Aquarius*

With a mixture of enthusiasm and curiosity I tore away the outer packaging to discover a futuristically styled computer, solid, if rather small. I threw aside the instruction pack, intending not to refer to it until an apparent breakage had occurred, and set to work.

As I cleared a space on my desk in order to set up this new wonder, my hand struck a slightly sticky object under a mound of paper and cassettes. Suddenly I was comparing Mattel's Aquarius with my own Spectrum: my attempt to see Aquarius through the eyes of an impartial first-time buyer had failed. What follows is therefore a somewhat bigoted view arrived at after a few weeks of dabbling in the simple delights of Aquarius.

The computer seems quite heavy for its size (13in × 6in × 2in), especially as the power supply is separate. This is attached permanently to the keyboard unit by a fairly lengthy lead which allows it to disappear down the back of the desk behind the telly, or anywhere else out of sight where it will get covered with dust, or worse. The keys are made of a hard, bright blue rubber: not unpleasant to use, but they require a good slab to make contact. Whilst the overall width of the keyboard is the same as the Spectrum, there are up to 13 keys to a row on the Aquarius (as opposed to the Spectrum's 10), which results in the Aquarius having considerably smaller keys. These factors preclude touch typing, at least for adults.

The setting up of the machine is well explained in the supplied literature, which includes a simple introduction in the form of a free standing flip-over booklet. All the sockets are familiar and reasonably solid. To the right of the keyboard a cover hides the expansion slot: this houses either a single cartridge or the mini-expander. A small green light is located in the bottom right hand corner of the computer which indicates when the machine is on, in response to a rocker switch found nearby on the side of the case. The last control is a reset key: at the top left of all the keys it is surrounded by a raised rim to prevent accidents, but I still managed to press it inadvertently. This need not be fatal, however: so by pressing *Ctr C* you can salvage your old program.

Inside the machine the impression continues to be one of a reasonably well constructed computer. There are no signs of the bodging that can be detected on early versions of other micros. The keyboard is connected to the main PCB by the fragile tails found in the ZX81, but then you're not supposed to take it apart.

The chip count is low: with a handful of logic chips, one 8K and one 2K Rom, 4K of static Ram, an NEC equivalent of a Z80 processor, and two custom built chips. Of the latter, the one made by Ferranti identifies itself as a ULA. Even after a phone call to Hitachi UK I can discover nothing about the other chip, except that it is a Programmable Gate Array (is this Japanese for "Mind your own business?). As Aquarius contains no well known video controller, we will have to wait for Mattel to release some technical information before we can find out precisely what it can be persuaded to do.

A voltage regulator is bolted to the corner of the heat sink which disappears under the PCB. Surprisingly, the heat sink is revealed to cover the entire base of the machine — here is the reason for the weight and rigidity of the computer. The few pence it would have cost to put something similar in the base of the Dragon would have been well spent considering the tendency of the larger (and more expensive) machine to dance around the table.

The Aquarius reassembled, I sighed with relief when it worked. I've broken better computers than this. I've also seen better computers unable to produce a decent picture on my tv: the Aquarius video was clear and steady. The screen can display 16 colours, but the resolution is restricted to two colours in each character space. Although claims for high resolution have been made for this machine, in reality this amounts to the excellent character set consisting of 256 shapes, which includes lower case and even a small running man. Yet you're stuck if you want to move a

shape around the screen one pixel at a time or draw a reasonable circle

There are 40 columns by 24 lines although the Basic only uses 38 columns. A 25th line exists at the top of the screen, but you can only address this by *Poking* the video Ram directly. However the first column of this line also dictates what appears in the screen border so you can fill the entire screen with for instance green pound note signs — should you be so inclined. The creation of dark borders did confuse my tv's line hold which is probably why this facility is not mentioned in the manual.

The sound output from Aquarius is routed through the tv speaker. In my opinion this is the best method but it requires a more expensive modulator together with the multiplex chip. Simple sound is generated by toggling bit 7 of port *FCH*. In Basic that means simple beeps but machine code has achieved passable speech on machines using the same system.

Aquarius' weakest point is undoubtedly its cassette storage. Mattel is selling a Data Recorder optimised for the Aquarius, but at £40 this seems a poor alternative to a robust interface. It required a good half hour of fiddling to set up, as the replay level is extremely critical. *Din* level is insufficient. I suspect that the computer is designed to accept Japanese 'line' level, as I settled on using an external speaker output turned down very low. By way of compensation the Basic supports a verify system.

Mattel is taking no chances with the language Aquarius uses — Microsoft is undoubtedly the most common dialect of Basic. The Aquarius contains 8K of Rom, which includes the operating system and by modern standards sparse Basic. For first time users there are plenty of commands to master, enough functions to confuse and no serious omissions to the language. Using a non-specialist 'teach yourself' tutor would cause no problems here. Very welcome is the use of optional single key entry for the most common commands and functions — these are laid out on a keyboard overlay and activated by holding down the *Ctrl* key.

One curious omission to my mind is the lack of a *Cls* command. Certainly you can clear the screen by using *Print Chr$ (II)* but, to the absolute beginner that may signal the onset of the computer jargon he or she is dreading.

This apparently trivial omission is indicative of the lack of graphic commands to use colour and moving shapes involves getting bogged down in a morass of *Peeks* and *Pokes*. There is a plotting system which manipulates the block graphics giving a monochrome resolution of 80 by 72, but with only 8K of Basic it is too much to expect system commands such as *Renumber* or *Block Delete*. Aquarius does support multi-dimension arrays. Microsoft-style string slicing and even a *Fre (x)* function which returns the amount of memory left. With a 4K machine there are 1731 bytes available, which in practice isn't much more than four screens of Basic and a handful of variables.

The biggest drawback to programming the machine is its lack of an Editor. Microsoft line Editors may be difficult to get accustomed to but they must be preferable to retyping lines completely.

Because of the size of my quite normal fingers on the small keys and especially because of the lack of an Editor I soon stopped using multi statement lines so it took some time to discover that the maximum line length is only 72 characters. On entering a simple monitor program to investigate the memory map I discovered that *Peeks* and *Pokes* only operate in the range *3000H* to *7FFFH*.

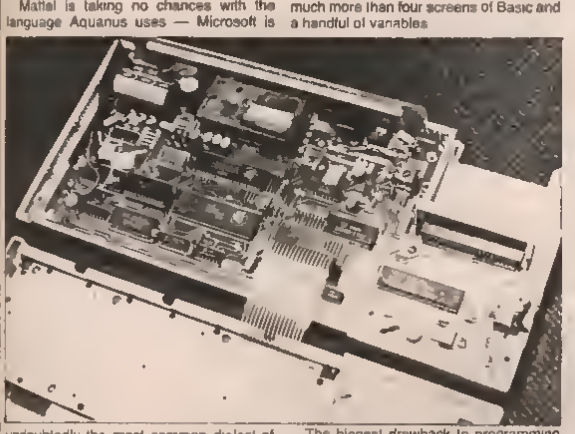
The manual gives one vital piece of information for those interested in using machine code: the address at which the call performed by *Usr (x)* is stored. A gentle dose of Z80 code soon revealed the unsurprising fact that the Rom sits between addresses *0* and *1FFFH* using the restart addresses for major routines such as printing to the screen. I found no trace of the character Rom. The area *2000H* to *3FFFH* is empty and the next 2K+ contains the video Ram and system variables. The screen is memory mapped in a logical manner with the colour file sitting exactly *400H* higher than the characters.

Having charged a mere £79 for their computer how do you think Mattel intend to wring additional fivers from our tightly clenched fists? You may not be surprised to discover that their range of attractive (some may say essential) add-ons are less competitively priced. The 4K static Ram pack costs £19.95 and the 16K dynamic Ram pack £49.95.

The mini-expander has slots for program and Ram cartridges and comes complete with two disc type hand controllers. Its prime component is a three channel sound chip the popular AY/3 8910 which also acts as the joystick interface and is used in many computers and add-on boxes. There seems to be no way of controlling the sound from Basic as the Aquarius has no *Out* command. The chip can be bought for under £5 retail yet the mini expander costs ten times that amount.

A printer is available for £140. It is a thermal 40 column device, controlled from Aquarius's serial port. Clear printing, quiet operation, and a copy command make it a pleasure to use but the print-out is really only up to listings standard.

continued on page 17

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Mattel's predominant interest is in selling software. They have access to a large range of titles already developed for the Intellevision system and as there is no point in reinventing the wheel I expect most of Aquanus games cartridges will be copies of these or rather imitations the video resolution not being quite up to Intellevision standards.

I was supplied with two plug-in games, similarly packaged and I set up the least promising first this was entitled *Snafu* which I believe, are the initials of a rather unsavoury American phrase. For your money you get the cartridge the instructions hand controller overlays and a keyboard overlay which comes in two parts in order that it can fit into the box. I left the whole lot in the hands of a British Standard Computer Illiterate while I had a bath and within five minutes the noises penetrating the bathroom indicated that no problems existed with the instructions or the game.

It is basically a surround-type game for two players and two computer controlled players, with variations. Although it is not much fun playing on your own, as the automatic opponents are rather predictable with two players it is embarrassingly addictive. Using the mini-expander not only added hand controllers, but also initially impressive music and sound effects. However, the banality of the music began to irritate after a short time.

The second game, *Utopia* promised to be a management game with arcade elements. But I found it a rather unhappy mixture lacking the kind of excitement or addictive quality which is essensel for a successful game. Both *Snafu* and *Utopia* used the standard graphics set and the results fell far short of arcade quality. No doubt games to suit all tastes will be produced but I suspect that the machine's limitations may sometimes show through.

On the more serious side Mattel has produced two major application tools — a spreadsheet calculator and a filing and limited wordprocessing package. I had a short time to try them, but much longer to study the documentation. *Finplan* the spreadsheet, seemed very simple to use for someone with little experience of these matters. The screen forms a window on a large sheet of calculations, the size being defined by the user up to a maximum of 63 columns by 255 rows. The manual demonstrates how to use the program with the example of calculating motoring expenses over a five-year period.

The virtues of the program emerge when prices change or you wish to speculate with such questions as "What if I bought a diesel engined car?" Anyone who enjoys the number juggling that this tool facilitates would find this program useful. Anyone who actually needs a system like this for business use would buy a professional one and claim for it against tax.

The second package, *Fileform* is a flexible program capable of acting as an address book, as record cards, or even as a limited wordprocessor. For this system to be more practical than pen and paper, however floppy discs are needed — the locating, loading, resaving and verifying of records of any length with a cassette storage system as slow (about 300 baud) as that of the Aquanus is a very tedious process.

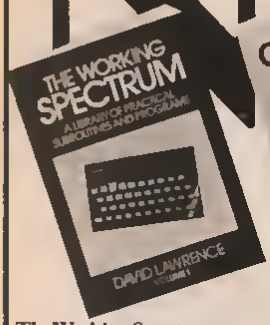
One important point to note is cost. Both programs need extra memory to be useful — a mini expander is needed to host both memory and program simultaneously — and the cartridges are £49.95. This makes the original cost of the computer look silly doesn't it?

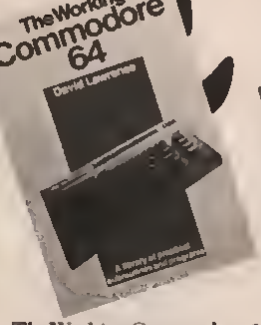
At least two additional languages are planned. Logo will attract the interest of educationalists and Extended Microsoft Basic promises to expand Basic to the level of sophistication which is becoming familiar to home users. It will be interesting to see what graphics commands are included. The quality of the programs is extremely high and the standard of documentation good with a helpful style of presentation the advantages of plug-in software, while not confined to the Aquanus, are exploited to the full.

Mattel promise some interesting add-ons including a CP/M disc system and a modem which is only awaiting British Telecom approval. Aquarive II is also coming soon — if Mattel stick by present policy, the Rom software should be upwardly compatible.

There is no one thing that I can blame for Aquanus's failure to impress me. The machine is a wonderful example of consumerist design but in most areas it is little more than adequate. If you want to try your hand at programming but also want a TV game then this machine does offer a low-cost option. Aquanus has squeezed into a constantly narrowing gap in the market and Mattel will have to juggle its prices carefully to achieve the market share they desire. ■

NEW





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Errors and mistakes

***Bryan Skinner** explains how to correct lengthy strings without re-entering them*

The assembly language database program *dBASE 2* uses a facility called *Correct & Retry?* In this, if an error of user input is detected the user is invited to alter the input without having to re-type all the input again How much more user-friendly this is than the brusque *Sn Error* of the Dragon or the patronising *Mistake* of the BBC

Carping apart, I so liked the principle of being able to modify a lengthy string without the chore of re-entry, and thus the possibility of more typo errors that I used it in my own database program for the Dragon to allow the user to modify the contents of a field within a record without having to re-enter the data from scratch

The routine is fairly simple All it really involves is testing that the characters to be replaced are in the main string setting the replacement characters slicing the string into left and right sections then inserting the replacement string

Of course there are other checks to be made such as ensuring that the resultant string will not exceed 255 characters in length preventing the user deleting all the characters in the string (or at least to warn them this has happened and provide the opportunity to enter a new string) and so on The coding is shown here in standard mBasic 5 21 dialect and, as such should run with few modifications on any micro (apart from the Sinclairs due to their odd string handling)

Using the routine simply involves putting the string to be altered into *A$* then executing a *Gosub 1000*

From the user's point of view, a modicum of thought is required before responding to the prompt *Enter characters to replace* For example, if the string is

'THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG

and you want to change the second "*THE* to "*A* , you should enter "*THE L* as the characters to replace and "*A L* for the replacement characters

Analysing the program shows that the only tricky bits are setting the strings pointers for the string handling routines Line 1130 finds if the characters to be replaced are in the main string setting *P* to their starting position if so 0 if an error of input has been made Thus in the example *P* would be set to 32 ie the point where the second '*THE* starts

Line 1160 sets *Ro$* to the right hand part of the main string excluding the characters to be replaced That is, it takes a number of characters defined by the formula *(LS P-LB+1) Ls* is the length of the main string *P* is the starting point of the items to be replaced *Lb* is the length of the string of items to be replaced and *1* takes care of the fact that we want the characters starting from the position *after* the end of the item(s) being replaced

This is best shown as follows

```
         12345678
MAIN STRING  THE QUICK GREEN FROG (length = 29)
REPLACE QUICK     |    |
         5        8
```

Here, we want to take the four leftmost characters (including the space after *the*) and the rightmost 11 characters This latter is calculated by subtracting the starting position of "*Quick* (ie 5) from the length of the string (20) giving 15 From this we subtract *LD (=5)*, the length of the word being replaced leaving 10 To this we must add 1 to start at the next letter which is this case is a space giving 11 as the number of characters to take from the right of the string

Similar reasoning lies behind line 1180 where we define the 'left string' as being the leftmost four characters by subtracting 1 from the starting point of the substring ■

```
10 PRINT"DEMONSTRATION OF STRING INSERTION"
20 PRINT:PRINT
30 A$="THE QUICK BROWN FOX JUMPS OVER THE LAZY
   DOG":REM SAMPLE STRING
40 GOSUB 1000:REM DO CHANGES IF WANTED
50 END:REM REST OF PROGRAM
1000 REM SUB ROUTINE FOR REPLACING CHARACTERS
1010 LS =LEN(A$)
1020 REM 'TRAP EMPTY STRING
1030 IF LS=0 THEN GOSUB 1300:IF C$="Y" THEN
     RETURN ELSE  GOTO 1000
1040 PRINT:PRINT"CURRENT ENTRY IS '";A$;"'"
1050 PRINT:PRINT"ANY CHANGES?...Y/N"
1060 C$=INKEY$:IF C$="" THEN 1060
1070 IF C$="N" THEN 1290
1080 IF C$<>"Y" THEN 1060
1090 PRINT:PRINT"ENTER CHARACTERS TO REPLACE
     ";:INPUT B$
1100 LB=LEN(B$)
1110 IF LB=0 THEN 1090:REM CAN'T JUST PRESS
     "ENTER"
1120 REM FIND POSITION OF INPUT B IN MAIN STRING
1130 P= INSTR(1,A$,B$)
1140 IF P=0 THEN PRINT"NOT FOUND":GOSUB
     1350:GOTO 1000
1150 REM IF NOT IN, ERROR MESSAGE, SPACE TO CONT.
     & REPEAT
1160 RO$=RIGHT$(A$,LS-P-LB+1):REM RIGHT PART OF
     MAIN STRING
1170 LR=LEN(RO$):REM LENGTH OF RIGHT PART OF
     MAIN STRING
1180 LF$=LEFT$(A$,P-1):REM LEFT PART OF MAIN
     STRING
1190 LL=P-1:REM LENGTH OF LEFT PART OF MAIN STRING
1200 PRINT:PRINT"ENTER REPLACEMENT CHARACTERS "
     ;:INPUT IN$
1210 REM IF "ENTER" PRESSED, DELETES STRING TO
     REPLACE
1220 LI=LEN(IN$):REM LENGTH OF STRING TO INSERT
1230 IF LL+LI+LR > 255 THEN PRINT"TOO LONG":GOSUB
     1350:GOTO 1020
1240 REM IF LENGTH OF ALL PARTS TO JOIN TOO LONG,
1250 REM GIVE ERROR MESSAGE & RESTART
1260 A$=LF$+IN$+RO$:REM MAKE NEW A$
1270 REM FROM LEFT$+INSERTION$+RIGHT$
1280 GOTO 1010:REM MORE CHANGES?
1290 RETURN:REM ALL DONE - A$ NOW OK
1300 REM ROUTINE FOR NULL STRING
1310 PRINT:PRINT"STRING IS EMPTY - OK?...Y/N"
1320 C$=INKEY$:IF C$="Y" THEN RETURN
1330 IF C$<>"N" THEN 1320
1340 PRINT:PRINT"ENTER NEW STRING ";:INPUT
     A$:RETURN
1350 PRINT"PRESS SPACE TO CONTINUE"
1360 C$=INKEY$:IF C$<> " " THEN 1360 ELSE RETURN
```

Instant colour . . .

***Mike Moacoff** presents a utility routine which produces 'instant' colour changes*

This machine code routine provides the ZX Spectrum with 20 colour registers (*1) enabling Basic users to produce fast colour changes. The 790 byte routine resides at address 31800(16K) or 62500(48K) (*2)

To use the routine first *Clear 31799* *Let cr=31800* (16K Spectrum) or *Clear 62499* *Let cr=62500* (48K Spectrum) Next, *Load* the machine code *(Gosub 9870* — see program 2 (16K) or 3 (48K)) Then decide how many registers to use and set-up the initial colours

POKE cr+n col

where *n* is the register number (1 20), and *col* is the register colour in *attr* format (1-255) (*3) NB *Attr* colour no 0 (black *Ink* on black *Paper*) is reserved by the routine and should not be used (*4)

Select the current register (as the register to be used for all subsequent *Print* *Draw* *Plot* and *Circle* commands)

POKE cr n

where *n* is the register number (1-20) Now you can *Print* *Draw* etc using the current register and then activate the machine-code routine

LET x=USR(cr+725)

Hold on — there's a catch! The routine will only recognise *Print* etc statements as belonging to the current register if all *attr* colours have been set to 0 *Ink 0 Paper 0 Bright 0 Flash 0* must be in effect)

Finally the fun starts! Having *Printed*, etc using various registers simply change the register colours *(Poke cr+n,col)* and activate the routine *(Let x=Usr(cr+725))* for 'instant' colour changes (see program 4) To clear all data areas (registers, 'virtual *attr* table), enter

LET x=USR(cr+776)

Program notes

POKE cr n sets the current register

POKE cr+n col sets register n's colour
LET x=USR(cr+725) activates the m/c routine (*5)
The routines logic is
For attr(n) = 22528 to 23231 (704 bytes)
  If attr(n) = 0 and 0 < cr < 21
    Then attr2(n) = cr
  If attr2(n) > 0
    Then attr(n) = regno(attr2(n))
Next attr
End
attr is the attribute area (22528 to 23231)
cr is the current colour register
attr2 is the virtual attribute table
regno is the register number (1-20)
LET x=USR(cr+776) clears all registers and the 'virtual attr table

Details

*1) In practice 10 registers is sufficient (Pgm 4 Demo 2 uses only 3) but 20 regs allows for multiple simultaneous effects and enhances one-up-machine-ship!
(The routine can be modified to cope with 256 registers)

*2) The 790 bytes consist of 725 bytes datas 65 bytes code The routine is not relocatable

*3) The attr number is INK No + 8*PAPER No + 64*BRIGHT No + 128*FLASH No See Spectrum manual for a full explanation

*4) If used it effectively disables the register

*5) Originally this routine was automatic (interrupt driven) but it takes up to 8 1 seconds to complete and at 65 x a second the Spectrum ground to a halt!
Reducing the call frequency (to 18 x sec) resulted in unpredictable results as text changes (via POKEs) were not always being actioned. ■

Program 1

```
7C38            0010          ORG  31800
7C38 00         0020 CREG     DEFB 0
0014            0030 REGS     DEFS 20
02C8            0040 ATR2     DEFS 704
7C0D 210000     0050 START    LD   HL,22528
7C10 11ADD0     0060          LD   DE,ATR2
7C13 01C002     0070          LD   BC,704
7C16 C5         0080 STEP1    PUSH BC
7C17 E5         0090          PUSH HL
7C18 AF         0100          XOR  A
7C19 BE         0110          CP   (HL)
7C1A 21387C     0120          LD   HL,CREG
7C1D 200A       0130          JR   NZ,STEP2
7C1F 7E         0140          LD   A,(HL)
7C20 FE00       0150          CP   0
7C22 2005       0160          JR   Z,STEP2
7C24 FE15       0170          CP   21
7C26 3001       0180          JR   NC,STEP2
7C28 12         0190          LD   (DE),A
7C29 1A         0200 STEP2    LD   A,(DE)
7C2A FE00       0210          CP   0
7C2C 2008       0220          JR   Z,STEP3
7C2E 0608       0230          LD   B,8
7C30 4F         0240          LD   C,A
7C31 09         0250          ADD  HL,BC
7C32 7E         0260          LD   A,(HL)
7C33 E1         0270          POP  HL
7C34 E5         0280          PUSH HL
7C35 77         0290          LD   (HL),A
7C36 E1         0300 STEP3    POP  HL
7C37 C1         0310          POP  BC
7C38 0B         0320          DEC  BC
7C39 23         0330          INC  HL
7C3A 13         0340          INC  DE
7C3B 79         0350          LD   A,C
7C3C B0         0360          OR   B
7C3D 2007       0370          JR   NZ,STEP1
7C3F C9         0380          RET
                0390
7C40 21387C     0400 CLEAR    LD   HL,CREG
7C43 01D502     0410          LD   BC,725
7C46 AF         0420 CLR02    XOR  A
7C47 77         0430          LD   (HL),A
7C48 23         0440          INC  HL
7C49 0B         0450          DEC  BC
7C4A 78         0460          LD   A,B
7C4B B1         0470          OR   C
7C4C 20FB       0480          JR   NZ,CLR02
7C4E C9         0490          RET
                0500
                0510          END
```

Program 2

```
   8 REM COLREG20 16K LORDER ©MM
   9 REM ----------------------
  10 CLEAR 31799  LET cr=31800
  20 GO SUB 9870
9865 STOP
9869 REM ----------------------
9870 RESTORE 9870  LET b=0: FOR
n=cr+725 TO cr+790: READ a: LET
b=b+a: POKE n,a: NEXT n
9871 IF b<>6543 THEN PRINT "CHEC
KSUM ERROR  6543 <> ";b: STOP
9872 RETURN
9876 DATA 33,0,88,17,77,124,1,19
2,2,197,229,175,190,33,56,124,52
,10,126,254,0,40,5,254,21,40,1,1
8,26,254,0,48,0,6,0,79,9,126,225
9879 DATA 229,119,225,193,11,35,
19,121,176,32,215,201,33,56,124,
1,213,2,176,119,36,11,120,177,32
,240,201
```

Program 3

```
   8 REM COLREG20 48K LORDER ©MM
   9 REM ----------------------
  10 CLEAR 62499: LET cr=63500
  20 GO SUB 9870
9865 STOP
9869 REM ----------------------
9870 RESTORE 9870  LET b=0: FOR
n=cr+725 TO cr+790: READ a: LET
b=b+a: POKE n,a: NEXT n
9871 IF b<>6543 THEN PRINT "CHEC
KSUM ERROR: 6543 <> ";b: STOP
9872 RETURN
9876 DATA 33,8,88,17,57,244,1,19
2,2,197,229,175,190,33,36,244,32
,10,126,254,0,40,5,254,21,40,1,1
8,26,254,0,48,0,6,0,79,9,126,225
9879 DATA 229,119,225,193,11,35,
19,121,176,32,215,201,33,36,244,
1,213,2,176,119,36,11,120,177,32
,240,201
```

Program 4

```
  5 REM COLREG20 DEMOS MMOSCOFF
  9 REM ---------------------
 10 CLEAR 31790   LET cr=31000
 20 GO SUB 9070
 30 INK 7  OVER 0  PAPER 0  BOR
DER 0  BRIGHT 0  FLASH 0  CLS
 39 REM Demos ---------------
 40 GO SUB 900: GO SUB 100
 45 GO SUB 900  GO SUB 200
 50 GO SUB 900  GO SUB 300
 55 GO SUB 900  GO SUB 400
 60 GO SUB 900  GO SUB 500
 65 GO SUB 900  GO SUB 600
 70 GO SUB 600  GO TO 30
 98 REM ---------------------
 99 REM Demo1 Print20 --------
 100 FOR n=1 TO 20  POKE cr+n,n
 POKE cr,n  PRINT INK 0,"COLREG"
,n," ##########################" L
ET x=USR (cr+725)  NEXT n
 110 LET ct=20  GO TO 940
 199 REM Demo2 Stress113 -----
 200 FOR n=1 TO 9  POKE cr+n,2+9
 POKE cr,n  FOR a=1 TO 4  LET x
=(n+a*3)*8  PLOT INK 0,127-x,176
-x  DRAW INK 0,0,-x/3  DRAW INK
0,x*2,0  DRAW INK 0;0,x/3: NEXT
a  LET x=USR (cr+725)  NEXT n  L
ET ct=3  GO TO 920
 299 REM Demo3 Circles7 --------
 300 FOR n=1 TO 7: POKE cr+n,n:
POKE cr,n  CIRCLE INK 0,127,87,n
*11  LET x=USR (cr+725)  NEXT n:
 LET ct=7  GO TO 910
 399 REM Demo4 Dvals7 ---------
 400 FOR n=0 TO 2*PI STEP .07  P
OKE cr+n+1,n+1: POKE cr,n+1  PLO
T INK 0,125,83  DRAW INK 0,120*S
IN n,80+COS n  LET x=USR (cr+725
)  NEXT n: LET ct=7  GO TO 910
 499 REM Demo5 Random7 --------
 500 FOR n=1 TO 7: POKE cr+n,n
POKE cr,n  FOR a=1 TO 10  PRINT
INK 0;AT a*2,RND*27,"REO",n  NEX
T a  LET x=USR (cr+725)  NEXT n
 LET ct=7  GO TO 910
 599 REM Demo6 Levels7 --------
 600 FOR n=1 TO 7  POKE cr+n,n
POKE cr,n  FOR a=1 TO 5  PLOT 12
7-(n+a)*10,190-n*24-a*3  DRAW IN
K 0,(n+a)*20,0  NEXT a  LET x=US
R (cr+725)  NEXT n  LET ct=7: GO
TO 910
 799 REM Demo7X Mixe47 -------
 800 OVER 1: FOR g=3 TO 0  FOR h
=3 TO 0  IF g>=h THEN GO TO 820
 805 GO SUB 900
 810 GO SUB g*100  GO SUB h*100
 820 NEXT h  NEXT g  RETURN
 899 REM Clear regs ----------
 900 CLS  LET x=USR (cr+776)  P
RINT #1,"COLREG20 DEM - ANY KEY
FOR NEXT "  RETURN
 909 REM Change regs ---------
 910 GO TO 920+INT (RND*4.2)*10
 919 REM Cycle up ct ---------
 920 LET x=PEEK (cr+ct): FOR n=c
t-1 TO 1 STEP -1  POKE cr+n+1,PE
EK (cr+n)  NEXT n  POKE cr+1,x:
LET x=USR (cr+725)  BEEP .01,42
IF INKEY$="" THEN GO TO 920
 921 RETURN
 929 REM Cycle down ct ---------
 930 LET x=PEEK (cr+1): FOR n=2
TO ct  POKE cr+n-1,PEEK (cr+n):
NEXT n  POKE cr+ct,x  LET x=USR
(cr+725)  BEEP .01,42  IF INKEY$
="" THEN GO TO 930
 931 RETURN
 939 REM Cycle up 255 --------
 940 FOR a=1 TO 254-ct: FOR n=1
TO ct  POKE cr+n,a+n  NEXT n  LE
T x=USR (cr+725)  BEEP .01,42: I
F INKEY$<>"" THEN RETURN
 941 NEXT a  GO TO 940
 949 REM Cycle down 255 --------
 950 FOR a=255 TO ct+8 STEP -1:
FOR n=1 TO ct  POKE cr+n,a-n  NE
XT n  LET x=USR (cr+725)  BEEP .
01,42  IF INKEY$<>"" THEN RETURN

 951 NEXT a  RETURN
 959 REM Random 255 ----------
 960 FOR n=1 TO ct  POKE cr+n,RN
D*254+1  NEXT n: LET x=USR (cr+7
25): BEEP .01,40  IF INKEY$="" T
HEN GO TO 960
 961 RETURN
 9550 REM ---------------------
 9570 REM As Leader Prog 2 (or 3)
 9872 RETURN
```

Learn your sums!

***Robert Westwood** presents a simple program for learning maths*

This program is designed to make a game out of learning maths especially for young children But, the game has been designed so that even adults could find it stretches their brain power

The program runs as follows — first you will be asked how many will be playing Next you will be asked for the level of difficulty which ranges from very simple to quite hard depending on the size of numbers entered

Each player has to answer a set number of questions The object of the game is to enter the answer to the sum before the spider reaches the numbers If you fail to answer in time, the spider weaves his web around the sum and the correct answer is drawn

As listed, the program only tests your powers of addition But by changing the calculations in lines 320 and 330 any other sums could be used ■

```
1 'numbers by r westwood
4 '******SET UP VARIABLES******
5 CLEAR1000,30000:X=90:Y=1:C=1
10 CLS:INPUT"HOW MANY WILL BE PLAYING";
G:DIMS(G),N$(G):CLS
15 INPUT"HOW MANY QUESTIONS EACH";A1:
INPUT"LARGEST FIRST NUMBER";A2:INPUT
"LARGEST SECOND NUMBER";A3
20 CLS:FOR A=1 TO G:PRINT"WHO IS PLAYER"
;A1:INPUTN$(A):NEXTA
25 CLS:PRINT@264,"PLEASE WAIT":GOTO100
29 '******TEXT SUBROUTINE******
30 ON(ASC(A$)-32)GOSUB31,32,33,34,35,36,
37,38,39,40,41,42,43,44,45,46,47,48,
49,50,51,52,53,54,55,56,57,58,59,60,
61,62,63,64,65,66,67,68,69,70,71,72,
73,74,75,76,77,78,79,80,81,82,83,84,
85,86,87,88:RETURN
31 DRAW"BM+8,+0":RETURN
32 DRAW"BM+0,-6DBM+2,+6":RETURN
33 DRAW"BM-7,-7E3BM+4,+10":RETURN
34 DRAW'BM-4,-7N3BM+7,+10":RETURN
35 DRAW"BM-8,-7E2F2BM+4,+7":RETURN
36 DRAW'BM-6,+1DGBM+7,-3":RETURN
37 DRAW'BM+0,-6DBM+4,+5":RETURN
38 DRAW"BM+2,+0HU4EBM+4,+6":RETURN
39 DRAW"BM+1,+0EU4HBM+5,+6":RETURN
40 DRAW"BM+0,-1E4BM+0,+4H4BM+8,+5":
RETURN
41 DRAW"BM+0,-3R4L2U2D4BM+5,+1":RETURN
42 DRAW"BM-1,+0DGBM+4,-2":RETURN
43 DRAW"BM+0,-3R4BM+4,+3":RETURN
44 DRAW"BM-1,+0UBM+4,+1":RETURN
45 DRAW"BM+0,-1E4BM+4,+5":RETURN
46 DRAW"BM+0,-1FR2EU4HL2GD4BM+8,+1":
RETURN
47 DRAW"BM+1,+0U6GBM+6,+5":RETURN
48 DRAW"BM+4,+0L4UER2EU2HL2GBM+8,+5":
RETURN
49 DRAW"BM+0,-1FR2EUHL2R2EUHL2GBM+8,+5"
:RETURN
50 DRAW"BM+3,+0U6G3R4BM+4,+3":RETURN
51 DRAW'BM+0,-1FR2EU2HL3U2R4BM+4,+6":
RETURN
52 DRAW"BM+0,-2ER2FDGL2HU4ER2FBM+4,+5":
RETURN
53 DRAW"BM+2,+0U2E2U2L4BM+8,+6":RETURN
54 DRAW"BM+1,+0R2EUHL2HUER2FDGL2GDFBM+7,
+0":RETURN
55 DRAW"BM+0,-1FR2EU4HL2GDFR3BM+4,+3":
RETURN
56 DRAW"BM+0,-5DBM+0,+2DBM+4,+1":RETURN
57 DRAW"BM+0,-5DBM+0,+2DGBM+5,+0":RETURN
58 RETURN
59 DRAW"BM+0,-2R4BM+0,-2L4BM+8,+4":
RETURN
60 RETURN
61 DRAW"BM+2,+0BM+0,-1UREUHLGBM+7,+5":
RETURN
62 '
63 DRAW"U5ER2FD5U3L4BM+8,+3":RETURN
64 DRAW"U6R3FDGFDGL3U3R3BM+5,+3":RETURN
65 DRAW"BM+1,+0HU4ER2FHL2GD4FR2EBM+4,+1"
:RETURN
66 DRAW"U6R3FD4GL3BM+8,+0":RETURN
67 DRAW"R4L4U3R4L4U3R4BM+4,+6":RETURN
68 DRAW"U3R4L4U3R4BM+4,+6":RETURN
69 DRAW"BM+1,+DR2EULRDGL2HU4ER2FBM+4,+5"
:RETURN
70 DRAW"U6D3R4U3D6BM+4,+0":RETURN
71 DRAW"BM+1,+0R2LU6LR2BM+4,+6":RETURN
72 DRAW'BM+0,-1FR2EU5BM+4,+6":RETURN
73 DRAW"U6BM+0,+3RE3G3F3BM+4,+0":RETURN
74 DRAW"R4L4U6BM+8,+6":RETURN
75 DRAW"U6F2E2D6BM+4,+0":RETURN
76 DRAW"U6DF4DU6BM+4,+6":RETURN
77 DRAW"BM+1,+0R2EU4HL2GD4FBM+7,+0":
RETURN
78 DRAW"U6R3FDGL3BM+8,+3":RETURN
79 DRAW"BM+1,+0R2EU4HL2GD4FBM+1,-2F2BM
+4,+0":RETURN
80 DRAW"U6R3FDGL3RF3BM+4,+0":RETURN
81 DRAW"BM+0,-1FR2EH4ER2FBM+4,+5":RETURN
82 DRAW"BM+2,+0U6L2R4BM+4,+6":RETURN
83 DRAW"BM+0,-6D5FR2EU5BM+4,+6":RETURN
84 DRAW"BM+0,-6D4F2E2U4BM+4,+6":RETURN
85 DRAW"BM+0,-6D6E2F2U6BM+4,+6":RETURN
86 DRAW"UE4UBM+0,+6UH4UBM+8,+6":RETURN
87 DRAW"BM+2,+0U4N2F2E2BM+4,+6":RETURN
88 DRAW"R4L4UE4UL4BM+8,+6":RETURN
99 '******DRAW SPIDER******
100 DIMS1(32,32),S2(32,32):PMODE1:PCLS:
DRAW"BM8,16;C2;U4E4NH4RBNE4F4D4F4D4U
4H4G4F4D4U4H4LBG4D4U4E4H4G4D4"
110 PAINT(18,16),2,2:PSET(12,14,3):PSET
(20,14,3)
120 PSET(15,18,4):PSET(17,17,4):PSET(18,
18,4)
130 GET(0,0)-(32,32),S1,G
140 PCLS
150 DRAW"BM8,16;U4E4NH4RBNE4F4D4ND6G4ND
6LBND6N4ND6":PRINT(18,16),2,2:PSET
(15,17,4):PSET(17,18,4):PSET(18,17,
4):PSET(12,14,3):PSET(20,14,3)
160 GET(0,0)-(32,32),S2,G
170 PCLS
199 '*****START MAIN LOOP*****
200 FOR1=1 TO G
210 CLS:PRINT@192,"IT'S YOUR TURN ";N$
(I):SCREEN0,1:FORA=1TO150STEP5:
SOUNDA,1:NEXTA
220 PMODE1,1:SCREEN1,0:SC=0
299 '*****CALCULATIONS*****
300 FOR F=1 TO A1
310 P=RND(A2):Q=RND(A3):X$=" "
320 R=P+Q
```

```
330 PCLS:B$=STR$(P)+"+"+STR$(O)+"=":
    DRAW"BM80,136":GOSUB1000
340 R$=STR$(R)
350 GOSUB1040
360 NEXT F
799 '*****PRINT INDIVIDUAL SCORES*****
800 PRINT@192,N$(I);" SCORED";SC;"
    POINTS":S(I)=SC
810 FORD=1TO2000:NEXT
820 NEXTI
890 IF G=1 THEN970
899 '*****SORT OUT SCORES INTO ORDER
     *****
900 FORY=1TOG-1
910 FORZ=1TOG-Y
920 IF S(Z)>=S(Z+1)THEN950
930 W=S(Z):S(Z)=S(Z+1):S(Z+1)=W
940 W$=N$(Z):N$(Z)=N$(Z+1):N$(Z+1)=W$
950 NEXTZ
960 NEXTY
970 CLS:PRINT"HERE ARE THE SCORES IN
    ORDER"
980 FORA=1TOG:PRINTN$(A);" SCORED ";S
    (A):NEXT:PRINT"PRESS ANY KEY FOR
    ANOTHER GO ":SCREENO,1
990 IF INKEY$=""THEN990 ELSE RUN
999 '*****DRAW CHARACTER*****
1000 C=C+1:IFC>4THENC=2
1010 DRAW"C"+STR$(C)+";S12;"
1020 FORA=1TO LEN(B$):A$=MID$(B$,A,1):
     GOSUB30:NEXTA:RETURN
1039 '*****CHECK FOR ANSWER*****
1040 B1$=INKEY$:IF B1$=""THEN2000 ELSE
     1050
1050 SOUND250,1:B$=B1$:GOSUB1000
1055 X$=X$+B$:IF X$=R$ THEN1100
1060 IF LEN(X$)>=LEN(R$) AND X$<>R$
     THEN 3000
1070 GOTO1040
1099 '*****CORRECT ANSWER*****
1100 FORP=1TO5:PLAY"T14V30O"+STR$(P)+"
     EFFL2ALSE":NEXTP:Z=0:SC=SC+1
1110 PUT(X,Y)-(X+32,Y+32),S2,PSET
1120 Y=Y-2:IFY<1THEN Y=1:RETURN
1130 GOTO1110
1999 '*****MOVE SPIDER*****
2000 Y=Y+1:PUT(X,Y)-(X+32,Y+32),S1,PSET
2010 SOUND(Y*2),1
2020 IFY>75THEN2040
2025 PUT(X,Y)-(X+32,Y+32),S2,PSET
2030 GOTO1040
2040 FORC=1TO50STEP4:CIRCLE(X+16,120),
     C,,,5:SOUNDC*5,2:NEXTC
2050 GOTO3000
2999 '*****DRAW CORRECT ANSWER*****
3000 DRAW"BM120,20":B$="ANSWER":GOSUB
     1000
3010 DRAW"BM150,50":B$=R$:GOSUB1000
3020 PLAY"T50IEL2GA#FEL2EO2L2DF#"
3030 FORD=1TO1500:NEXT
3040 Y=1:RETURN
```

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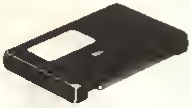

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Assembled - part four

***Jeremy Ruston** continues his introduction to assembly language programming*

The *Bvc* and *Bvs* instructions operate in the same way as the *Bcc* instruction *Bvc* means Branch if Overflow Clear and will only carry out a branch instruction if the overflow flag is unset The *Bvs* instruction means Branch if Overflow Set and will only carry out a branch instruction if the overflow flag is set

The *Clc* instruction simply clears the carry flag and is often used just before an *Adc* instruction if the carry flat is not being used in that instruction The *Cld* instruction clears the decimal flag Under normal conditions the decimal flag is unset which implies that binary arithmetic will be carried out

The *Cli* instruction clears the interrupt enable flag in other words, enabling interrupts Under normal circumstances interrupts are enabled, so this instruction need not be used The *Clv* instruction clears the overflow flag

The *Cmp* instruction subtracts the contents of a selected memory location from the accumulator and sets the condition flags accordingly but does not alter the contents of the accumulator on memory byte It offers the same memory addressing options as the *Adc* instruction The flags set by the *Cmp* instruction after a sequence of instructions like

```
LDA <number 1>
CMP <number 2>
```

are as follows

```
<number 1>   <number 2> Z=1
<number 1> <> <number 2> Z=0
<number 1> >= <number 2> C=1
<number 1> > <number 2> C=0
```

The table assumes unsigned arithmetic is being used

Using this table you can test numbers to see which is larger and then use a branch instruction to alter the course of the program depending on some relation

The *Cpx* instruction stands for ComPare X register It is identical in intent to the *Cmp* instruction with the exception that the *X* register is used in preference to the accumulator The addressing modes you can use with this instruction are much more limited

```
Immediate eg CPX &23
Zero page eg CPX &23
Absolute eg CPX &2000
```

This means that you can only compare the contents of the *X* register to a constant or to the contents of a memory location whose address is known at the time the program is written/assembled

The *Cpy* instruction is exactly equivalent to the *Cpx* instruction except that the *Y* register is used rather than the *X* register The same three addressing modes are used but again the *Y* register is used rather than the *X* register

The *Dec* instruction stands for DECrement It decrements the contents of a location (by 1) and sets various flags accordingly The addressing modes allowed are

```
Zero page direct, eg DEC &A5
Absolute direct eg DEC &7C00
Zero page indexed with X, eg DEC &20 X
Absolute indexed with X, eg DEC &7C00 X
```

The flags affected are the sign and zero flags

The *Dex* instruction decrements the *X* register and sets the sign and zero flags *Dey* decrements the *Y* index register and sets the sign and zero flags

The *Eor* instruction Exclusive ORs the contents of the accumulator with the contents of a selected memory location It offers the same addressing options as the *Adc* instruction The condition flags affected are the sign flag and the zero flag

The *Inc* instruction increments a memory location by 1 but otherwise behaves like the *Dec* instruction The *Inx* instruction increments the *X* register and sets the sign and the zero flags according to the new value in the *X* register The *Iny* instruction does the same for the *Y* register

The *Jmp* instruction passes program control to a new address by altering the value in the program counter It is used with labels in the same way as the branch instruction we looked at earlier Two addressing modes are allowed

```
Absolute direct eg JMP &FFEE
Indirect eg JMP (&208)
```

With indirect jumps the program counter is loaded with the 16 bit number to be found at the locations indicated (*lsb* then *msb*)

The *Jsr* instruction is the assembly language equivalent of the Basic word *Gosub*, in that it is used to call subroutines Similarly the *Rts* instruction is the equivalent of *Return* So a subroutine in assembly language looks like this

```
<main program>
JSR <label>
<rest of program>

<label>
<subroutine code>
RTS
```

The internal action of *Jsr* is quite complex It first pushes the address of the instruction following the *Jsr* instruction on to the stack This address will be the current contents of the program counter because the 6502 doesn't process an instruction until the entire instruction has been read in Finally it carries out a normal *Jmp* to the address of the subroutine indicated

The *Rts* instruction simply retrieves the address from the stack, and jumps to it The idea of using the stack is that it allows you to 'nest' subroutines — have one subroutine being called from inside another Irritatingly indirect subroutine calls are not allowed, eg *Jsr (&200)*

The *Lda* instruction loads the accumulator from a memory location The addressing modes allowed are the same as for the *Adc* instruction After the accumulator has been loaded, the sign and zero flags are adjusted to reflect the new value

The *Ldx* instruction loads the index register *X* from a memory location The following addressing modes can be used

```
Immediate eg LDX &&20
Zero page eg LDX &20
Absolute eg LDX &2000
Zero page indexed with Y eg LDX &20 Y
Absolute indexed with Y eg LDX &2000 Y
```

The sign and zero flags reflect the value loaded into the *X* register

The *Ldy* instruction loads the *Y* register with the contents of a memory location Again it affects the sign and zero flags The addressing modes allowed are

```
Immediate eg LDY &A9
Zero page eg LDY &45
Absolute eg LDY &4500
Zero page indexed with X eg LDY &A5 X
Absolute indexed with X eg LDY &4500 X
```

The *Lsr* instruction moves all the bits in the selected byte one position to the right It is thus the opposite of *Asl* Like the *Asl* instruction, the previous contents of bit 0 are copied into the carry flag and zero is copied into bit 7 The sign flag is always unset (think about it) whilst the zero flag is set if the result was zero

The addressing modes allowed are

```
Accumulator eg LSR A
Zero page eg LSR&56
Absolute eg LSR &5678
Zero page indexed with X eg LSR &56 X
Absolute indexed with X eg LSR &5678,X
```

The *Nop* instruction has no effect, which is why it is called 'No OPeration' It is rarely used in assembly programming but is often useful in machine code programming Its only effect is to use up memory, so it can be substituted for instructions you wish to omit from a program in Rem

The *Ora* instruction logically *Ors* the contents of a selected memory location with the accumulator The addressing modes allowed are the same as for the *Adc* instruction Additionally the condition flags affected are the sign and zero flags

The *Pha* instruction which means PushH Accumulator (on to the stack) does just that It is often used for restoring return addresses and passing parameters on the stack No condition flags are affected Saving the accumulator on the stack is a good way of maintaining its value through a subroutine call For example the operating system routines provided to do things like print characters on the screen usually retain the value of the accumulator when they pass control back to their calling program They do this by pushing the accumulator on entry and pulling it back as soon as they leave ■

To be continued next week

This is an extract from *The BBC Micro Compendium* available from 1 August from Interface Publications 44-46 Earls Court Road London W8 6EJ

Modules 1—4

Module 1.1
The purpose of this module is to set up a number of variables which will be used later in the program. The function of the variables is explained briefly in the accompanying table, but full understanding will only come as subsequent sections of the program are entered and the variables actually used. At this stage it is enough simply to enter the module correctly — the only visible effect of running it will be to change the screen colour.

Module 1.2
This temporary module is placed into the program at this point to allow for the fact that the initialisation routine calls up a later section of the Mastercode program which will not be entered yet. The lines contained in this module will be overwritten when subsequent sections of the Mastercode program are entered.

Module 1.3
Every complex program needs to provide the user with a means of selecting which of its many functions is to be used next. Such a facility is called a control routine or, more simply, a menu. The menu given here is more complex than it need strictly have been for the current program. This is because the Monitor program is designed so that it can later be extended by adding subsequent sections of the overall Mastercode Assembler. Rather than having to enter new program lines to take account of the extra functions that will be provided, the menu will automatically extend itself to take account of new option names entered into the data statements.

Output of memory contents to screen
Now we shall examine those sections of the program which are necessary to enable us to print out, in an orderly fashion, the contents of a specified area of memory. The modules commented on here may appear very insignificant and you may wonder why it is that they have not been run together to make one module. As you continue through the Mastercode program, however, you will see that individual modules may actually be called up for use from many different parts of the program. Keeping the modules to one particular function and one only will enable us to save on the eventual number of program lines employed rather than have to duplicate the same lines later in another section of the program.

Module 1.4
This three line module transforms a decimal number into a hexadecimal number, that is one with a base of 16 rather than a base of 10. Machine code programmers almost universally use hexadecimal numbers, for the simple reason that they conform much more logically to the system of binary arithmetic used by a computer.

The hexadecimal numbering system has 16, rather than 10 digits, as follows:

0123456789ABCDEF

Most modern computers store numbers in units of 256 (0-255), and the reason that hexadecimal is so convenient is that with a two digit hexadecimal number, the maximum value which can be expressed is also 255 (15*16 for the high digit and 15 for the low). Using hexadecimal means that a much more orderly representation of the values stored in memory can be made.

In addition, the binary system used by the computer means that very often apparently significant numbers in hexadecimal like 1000 (or 4096 in decimal) are also significant in terms of the operation of the computer. Beginning to think in hexadecimal is an important aid to beginning to understand the workings of the micro.

Commentary
The operation of line 11020 is best explained by use of an example. Assume that the decimal number 4875 has been stored in the variable *H*. To convert that value into hexadecimal, we need first to recognise that it is made up of 1 * 16 ↑ 3 (16 ↑ 3 = 4096) + 3 * 16 ↑ 2 (16 ↑ 2 = 256) + 0 * 16 ↑ 1 (16 ↑ 1 = 16) + 11 * 16 ↑ 0 (16 ↑ 0 = 1). This line isolates each of these units of different powers of 16 and then translates them into a character which represents the appropriate hexadecimal digit, using the user-defined function *Fnhex* (see line 10040) to select the correct character. In the case of 4875 the hexadecimal number will be 130B.

For units with a value from 0-9, *Fnhex* simply returns the value of the appropriate character 0-9 (character codes 48-57). If the value of the unit is from 10-15, then a further 7 is added to the character code value to take it into the range *A-F* in the 64's character set. ■

This is an extract from Commodore 64 Master Code Master by David Lawrence and Mark England, published by Sunshine Books

```
MODULE 1.1

10000 REM*****************************
10020 REM GENERAL INITIALISATION
10030 REM*****************************
10031 BASE = 16
10032 IF LEN(PTR$)+LEN(E$)<>255 THEN CLR
 : GOSUB 19000
10035 DEV = 1
10040 DEFFN HEX(X) = (X AND 15)+48-((X A
ND 15)>9)*7
10050 DEFFN DEC(X) = X-48+(X>57)*7
10060 FALSE = 0 : TRUE = -1
10070 POKE 53281,1 : POKE 53280,15
```

```
MODULE 1.2

19000 REM*****************************
19001 REM TEMPORARY LINES
19002 REM*****************************
19010 RETURN
19011 REM ***END OF MONITOR PROGRAM***
```

```
MODULE 1.4

11000 REM*****************************
11001 REM CONVERT DECIMAL TO HEX
11002 REM*****************************
11010 T = H : H$ = ""
11020 H$ = CHR$(FNHEX(T-INT(T/16)*16))+H
$ : T = INT(T/16) : IF T>0 THEN 11020
11050 RETURN
```

```
MODULE 1.3

10100 REM*****************************
10101 REM CONTROL ROUTINE FOR MONITOR
10102 REM*****************************
10110 DATA EXIT TO BASIC,MEMORY MODIFY,M
EMORY DUMP,MACHINE CODE EXCUTE
10111 DATA LOAD MACHINE CODE FILE,SAVE M
ACHINE CODE FILE
10120 DATA DISASSEMBLER
10130 DATA FILE EDITOR
10140 DATA ASSEMBLER
10190 DATA END
10200 RESTORE
10220 X = 0
10230 PRINT "[BLUE][CLR]--------- MACHIN
E CODE MONITOR ---------[GREEN][CD]"
10250 READ T$
10260 IF T$<>"END" THEN PRINT TAB(5) X "
)" T$ : X= X+1 : GOTO 10250
10265 IF X<15 THEN FOR Y = X TO 15 : PRI
NT : NEXT
10270 PRINT "COMMAND ( 0 -" X-1 " ) : ";
: INPUT T
10300 IF T<0 OR T>X THEN 10100
10305 IF T=0 THEN PRINT "[CLR][4*CD]
              [RVS ON]BYE[RVS OFF][4*CD]"
 : CLOSE 1 : END
10310 ON T GOSUB 13100,13300,13500,14300
,14100,15000,24000,20000
10320 GOTO 10100
```

OPEN FORUM

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Monitor

on Spectrum

This program allows you to look at and change any part of the *Rom* or the *Ram*. Eight bytes are displayed per line in decimal and hexidecimal with a maximum of 48 bytes per screen. The program has many options, they are

Key

5	Moves cursor left
8	Moves cursor right
7	Moves cursor up
6	Moves cursor down
E	Press to change one of the bytes. the cursor must be at the start of the number (hex or decimal). Three numbers must be entered for a decimal number (005) and two for a hex number (05). Both the hex and the decimal number will change
C	Continue to next page of memory
A	Save part of memory
S	New start address of next page
R	Address to call a machine code program
T	Change *Ramtop*
L	Load a machine code program

Variables

FN H() — change hex number to decimal
FN D$() — change decimal number to hex
$START — start of memory to view
X — x coordinate of cursor
Y — y coordinate of cursor
F — main loop
ADD — address of your entry
RAM — ramtop

```
  10 REM #######################
         #MACHINE CODE MONITOR##
         ##& @ ANDREW FILBY ###
         #######################
  20 DEF FN H()=16*(CODE A$-48-7
*(CODE A$>64) -32*(CODE A$>96)) +(
CODE A$(2)-48-7*(CODE A$(2)>64) -
32*(CODE A$(2)>96))
  30 DEF FN D$()=CHR$ (INT (V/16
)+48+7*((INT (V/16))>9))+CHR$ (V
-16*(INT (V/16))+48+7*((V-16*(IN
T (V/16))>9)))
  40 LET X=0  LET Y=0
  60 PAPER 0  INK 7  CLS  BORDE
R 0  INPUT "START ADDRESS ? ",ST
ART  IF START<0 OR START>65536-6
6 THEN GO TO 50
  68 FOR F=START TO 65535
  70 PRINT TAB 7, INK 7, PAPER 2
,"MACHINE CODE MONITOR".AT 0,0,
 FOR Z=F TO F+40
  80 PRINT INK 8, INVERSE 1,Z
  90 LET T=0  FOR V=Z TO Z+7
 100 POKE 23692,255
 110 PRINT PAPER 1,TAB T,"0" AND
(PEEK V<100),PEEK V.  LET T=T+4
 120 NEXT V
 130 LET T=0  FOR G=Z TO Z+7
 140 LET V=PEEK G.  PRINT PAPER 1
TAB T,FN D$(),. LET T=T+4
 150 NEXT G  PRINT PAPER 1," "
 160 LET Z=Z+7  NEXT Z
 170 IF INKEY$<>"A" AND INKEY$<>
"S" THEN GO TO 320
 180 INPUT "NAME ? ",A$  IF LEN
A$>9 OR LEN A$=0 THEN GO TO 180
 190 INPUT "START ? " ST  IF STA
RT<0 OR START>65536 THEN GO TO 1
90
 200 INPUT "LENGTH ? ",LE  IF LE
<0 OR LE+START>65535 THEN GO TO
200
 210 SAVE A$CODE START,LE
 220 IF INKEY$<>"S" AND INKEY$<>
"S" THEN GO TO 300  INPUT "START
ADDRESS IN DECIMAL?",START  CLS
  GO TO 50
 230 INPUT "START ADDRESS IN DEC
IMAL?",START  IF START<0 OR STAR
T>65535-55 THEN GO TO 300
 240 CLS  GO TO 50
 250 PRINT AT Y,X, OVER 1, INK 5
, PAPER 6," ", BEEP .01,-20 PR
INT AT Y,X; INK 6, PAPER 6, OVER
1,"-"
 260 IF INKEY$<>"R" AND INKEY$<>
"r" THEN GO TO 290  INPUT " CALL
ADDRESS ?",CALL  RANDOMIZE USR
CALL
 270 INPUT " CALL ADDRESS ?",CAL
L. IF CALL<0 OR CALL>65534 THEN
GO TO 270
 280 RANDOMIZE USR CALL
 290 IF INKEY$<>"T" AND INKEY$<>
"t" THEN GO TO 320  INPUT "NEW R
AMTOP VALUE ? ",RAM  CLEAR RAM
RUN
 300 INPUT "NEW RAMTOP VALUE ? "
,RAM  IF RAM<50000 OR RAM>65535
THEN GO TO 300
 310 CLEAR RAM  RUN
 320 IF INKEY$<>"L" AND INKEY$<>
"l" THEN GO TO 340
 330 INPUT "NAME ? " N$  IF LEN
N$<10 THEN INPUT "START ? ",ST
IF ST<65534 THEN LOAD N$CODE AT
 340 LET Y=Y+(INKEY$="5" AND (Y<
20)) -(INKEY$="7" AND (Y.0));
 350 LET X=X+(INKEY$="8" AND (X<
30)) -(INKEY$="5" AND (X>0));
 360 IF INKEY$="E" OR INKEY$="e"
THEN GO TO 390
 370 IF INKEY$="C" OR INKEY$="c"
THEN LET F=F+56  CLS  NEXT F
RUN
 380 GO TO 170
 390 IF X<>0 AND X<>4 AND X<>8 A
ND X<>12 AND X<>16 AND X<>20 AND
 X<>24 AND X<>28 THEN GO TO 260
 400 IF Y<>1 AND Y<>4 AND Y<>7 A
ND Y<>10 AND Y<>15 AND Y<>18 AND
 Y<>19 THEN GO TO 580
 410 BEEP .2,30  LET D$="  ", F
OR B=1 TO 3
 420 LET C$=INKEY$  IF C$<"0" OR
C$>"9" THEN GO TO 430
 430 IF B=1 AND C$>"2" THEN GO T
O 250
 440 IF B=0 AND C$>"9" THEN GO T
O 250
 450 IF B=3 AND C$>"9" THEN GO T
O 250
 455 IF B=2 AND D$(1)="2" THEN I
F C$>"5" THEN GO TO 250
 456 IF B=3 AND D$(1)="2" AND D$
(2)="6" THEN IF C$>"5" THEN GO T
O 250
 460 LET D$(B)=C$  PRINT AT Y,X+
B-1, PAPER 0, INK 0,C$  BEEP .1,
0
 470 NEXT B  GO SUB 400  GO TO 5
80
 480 LET AD=0  IF Y>2 THEN LET A
D=8
 490 IF Y>5 THEN LET AD=16
 500 IF Y>8 THEN LET AD=24
 510 IF Y>11 THEN LET AD=32
 520 IF Y>14 THEN LET AD=40
 530 IF Y>17 THEN LET AD=48
 540 LET AD=AD+X/4  RETURN
 550 LET V=VAL D$  POKE F+AD,V
 560 PRINT AT Y+1 X, PAPER 1, IN
K 7,FN D$()
 570 GO TO 150
 580 IF Y<2 AND Y<>0 AND Y<>6 A
ND Y<>11 AND Y<>14 AND Y<>17 AND
Y<>20 THEN GO TO 250
 590 GO SUB 480
 600 LET A$="00"  BEEP .1,30  FO
R B=1 TO 2
 610 LET G$=INKEY$  IF G$<"0" OR
G$>"F" THEN GO TO 610
 620 LET A$(B)=G$  PRINT AT Y,X+
B-1, INK 7, PAPER 1,G$,  BEEP .1
,0  NEXT B
 630 PRINT PAPER 8  INK 6 AT Y-1
X,FN H().  ":
 640 POKE F+AD,FN H()
 650 GO TO 350
```

Monitor
by Andrew Filby

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Concentrics

on Lynx

This program draws concentric rectangles and triangles. By using the same principles (and a little thought) it should be possible to do the same thing for other shapes.

Program notes

A C	= Top left corner
B C	= Top right corner
B D	= Bottom right corner
A D	= Bottom left corner
B A	= Top
C D	= Bottom right
E D	= Bottom left

```
1 REM***CONCENTRICS***
2 REM***HOK PANG 1983***
5 PAPER 0
10 CLS
15 REM***RECTANGLES***
20 LET A=8,B=250,C=10 D=240
30 REPEAT
40 MOVE A,C
45 INK 5
50 DRAW B,C
55 INK 2
60 DRAW B,D
65 INK 5
70 DRAW A,D
75 INK 2
80 DRAW A,C
90 LET A=A+2,B=B-2,D=D-2 C=C+2
100 UNTIL C=110
110 CLS
115 REM***TRIANGLES***
120 LET A=0,B=124,C=224,D=208,E=24
130 REPEAT
140 MOVE B,A
145 PROC INK
150 DRAW C,D
155 PROC INK
160 DRAW E,D
165 PROC INK
170 DRAW B,A
180 LET A=A+4,C=C-4,D=D-4 E=E+4
190 UNTIL A=256
195 END
200 REM***RANDOM INK COLOUR***
210 DEFPROC INK
220 INK RAND(6)+1
230 ENDPROC
READY.
```

TRY CHANGING LINES 90 AND 130 TO

```
90 LET A=A+RAND(4),B=B-RAND(4)
   D=D-RAND(4),C=C+RAND(4)
180 LET A=A+RAND(4),B=B-RAND(4),
   C=C-RAND(4),E=E+RAND(4)
```

Concentrics
by Hok Pang

Vocabulary

on Dragon

This is a Vocabulary Test Program. If you have a lot of words then change the *Clear* statement in line 40. The pass mark is 7 out of 10. If you get the perfect mark then you are rewarded with a tune. It would be easy to modify this program as a word-meaning recognition program.

Full instructions are included in the program.

Program notes

40-50	Initialise Variables
60-170	Enter words
180-280	Actual test
290-300	Check answers
300-370	Another Go routine
380-490	Victory music
400-520	Instructions

```
10 REMVOCAB
20 REMFOR A DRAGON 32
30 REM(C)E.WALFORD 1983
40 CLEAR3000
50 CLS
60 U=0
70 GOSUB400
80 CLS
90 INPUT"WHICH LANGUAGE";L$
100 CLS
110 INPUT"HOW MANY WORDS ";Z
120 PRINT"ENTER ";L$;" WORDS.
130 DIM$(Z),E$(Z)
140 FORE=1TOZ
150 LINEINPUT$(E) NEXTE
160 PRINT"NOW THE ENGLISH "
170 FORS=1TOZ:LINEINPUTE$(S):NEXTS
180 CLS
190 FORI=1TOZ
200 C=RND(Z)
210 PRINT"WHAT IS ";E$(C);" ?"
220 LINEINPUTP$
230 IFP$<>G$(C)THENPRINT WRONG ;L$;" FO
R ";E$(C);" IS ";G$(C) SOUND12,2
240 IFP$=G$(C)THEN280
250 PRINT"CORRECT" U=U+1 SOUND300,8
260 PLAY"P2P3 CLS:NEXTI
270 CLS:IFU<7THENPRINT@230,"YOU FAILED
";10-U;" WRONG" SOUND12,30 GOTO300
280 IFU>=7ANDU<8THENPRINT@230,"WELL DON
E";10-U; WRONG SOUND200,30:GOTO300
290 PRINT@327,"**WELL DONE,ALL CORRECT**
";:GOSUB300
300 CLS:PRINT@88,"ANOTHER GO?
310 PRINT@100,"PRESS KEY(1)FOR SAME WORD
S,"
320 PRINT@132,"PRESS KEY(2)FOR NEW WORDS
330 PRINT@184,"PRESS KEY(A)TO STOP "
340 IFINKEY$="1"THENCLS U=0:GOTO190
350 IFINKEY$="2"THEN CLEAR RUN
360 IFINKEY$="A"THEN END
370 IFINKEY$=""THEN340ELSE340
380 A$="T5;C;E;F;L1;G;P4;L4,C,E,F,L1,G"
390 B$="P4,L4,G,E;F;L2;G;E;D,E,L1,D"
400 C$="P8;L4,E,E,D,L2 ,C,L4,C,L2,E"
410 D$="L4,G,G,G;L1;F,L4,E;F"
420 E$= L2,G;E,L4,C,L8,G;D+,E;G,L4(A)L1;D3,C"
430 X$="XA$;XB$;XC$,XD$,XE$;
440 PLAYX$
450 RETURN
460 PRINTSTRING$(32,42)
470 PRINTSTRING$(1,42)"VOCAB TEST"STRIN
G$(1,42)
480 PRINT"BEFORE YOU TAKE THE PROPER TES
T,TEST YOURSELF
490 PRINT THIS PROGRAM LETS YOU ENTER AN
Y NUMBER OF WORDS IN ANY LANGUAGE
     GOODLUCK!"
500 PRINT@452, COPYRIGHT E WALFORD 1983"
510 PRINT@389,"PRESS ANY KEY TO START"
520 IFINKEY$<>"" THEN RETURN ELSE520
```

Vocabulary
by Edwin Watford

Dragon maze

on Dragon

This program generates a random 8 by 8 maze and displays a 3D image of it on the screen. The facility of the Dragon to alter the position of the screen in memory is used to allow the old screen to be displayed while the new screen is being formatted giving a smoother effect. By changing line 110 to

```
110 P=1:PMODE 4,1
```

The generating of the maze can take up to 30 seconds to complete this is because the program checks that as many passages as possible have been set up without creating corridors with no exits.

Program notes

10-100	Control section
200-394	Calls line printing routines
400-460	Prints vertical lines
470-510	Prints diagonal lines
520-900	Sets up the maze
910-1200	Update movement fields
1340-1500	Screen messages

PROGRAM OF THE WEEK

```
10 PCLEAR 8
20 DIM M(8,8)
30 P=1:E=0:T=0
40 GOSUB 520
50 PMODE 4,1:PCLS
60 MX=RND(8):MY=RND(8):MD=RND(4)
70 IF MX=EX OR MY=EY THEN 60
80 X2=0:X3=254:Y2=0:Y3=190
90 GOSUB 200
100 SCREEN 1,0
110 IF P=5 THEN P=1:PMODE 4,1 ELSE P=5:
                                PMODE 4,5
120 PCLS
130 GOSUB 1180
140 IF E=0 THEN 80
150 E=0
160 CLS:PRINT@100,"WELL DONE ":PRINT@164,
              "YOU HAVE FOUND THE EXIT"
170 PRINT@260,"DO YOU WANT ANOTHER GAME
                                      ?"
180 A$=INKEY$:IF A$="N" THEN END ELSE IF
                        A$ "Y" THEN 180
190 RUN
200 X=28:Y=22:M1=MX:M2=MY
210 GOSUB 910:GOSUB 400
220 IF FM=2 THEN MD=1:GOTO 390
230 IF FM=0 OR FM=2 THEN MD=0:GOTO 390
                     ELSE MD=1:GOSUB 910
240 X=66:Y=50
250 IF FM=2 THEN 390
260 GOSUB 400
270 IF FM=0 OR FM=2 THEN 390 ELSE GOSUB
                                    910
280 IF FM=2 THEN 390
290 X=94:Y=70
300 GOSUB 400
310 IF FM=0 OR FM=2 THEN 390 ELSE GOSUB
                                    910
320 IF FM=2 THEN 390
330 X=112:Y=84
340 GOSUB 400
350 IF FM=0 OR FM=2 THEN 390
360 X=127:X1=127:Y=95:Y1=95
370 FM=1:LM=0:RM=0
380 GOSUB 470
390 RETURN
400 'PRINT LINES
410 Y1=252-X:Y1=190-Y
420 LINE (X,Y)-(X,Y1),PSET
430 LINE (X1,Y)-(X1,Y1),PSET
440 GOSUB 470
450 X2=X:X3=X1:Y2=Y:Y3=Y1
460 RETURN
470 'DIAGONALS
480 IF LM=0 THEN LINE (X2,Y2)-(X,Y),PSET
:LINE (X2,Y3)-(X,Y1),PSET ELSE LINE (X,
  )-(X2,Y),PSET:LINE (X,Y1)-(X2,Y1),PSET
490 IF RM=0 THEN LINE(X3,Y2)-(X1,Y),PSET
:LINE(X3,Y3)-(X1,Y1),PSET ELSE LINE(X1,
  )-(X3,Y),PSET:LINE(X1,Y1)-(X3,Y1),PSET
500 IF FM=0 THEN LINE (X,Y)-(X1,Y),PSET:
                LINE (X,Y1)-(X1,Y1),PSET
510 RETURN
520 ' SET UP MAZE
530 POKE&HFFD7,1
540 IF RND(2)=1 THENEX=RND(8):EY=RND(
-1)*7+1 ELSE EX=RND(8):EX=RND(2)-1)*7+1
550 IF EX=1 THEN M(EX,EY)=1:GOTO 580
560 IF EX=8 THEN M(EX,EY)=100:GOTO 580
570 IF EY=1 THEN M(EX,EY)=1000 ELSE M(EX
                                    ,EY)=10
580 GOSUB 670
590 F=0
600 FOR X=1TO8:FORY=1TO8
610 IF M(X,Y)=0 THEN EX=X:EY=Y:GOSUB 67
                                    0:F=F+1
620 NEXT Y,X
630 GOSUB 1340
640 IF F 64 THEN F=0:GOTO 600
650 POKE&HFFD6,1
660 RETURN
670 'SET UP MAZE UNTIL STUCK
680 IF F\60 THEN R=RND(4) ELSE R=RND(6)
690 IF R>4 THEN 900
700 FOR Z1=R TO R+4
710 IF Z1\4 THEN Z=Z1-4 ELSE Z=Z1
720 ON Z GOTO 730,770,810,850
730 IF EY-1=0 THEN 890
740 IF M(EX,EY-1)<>0 THEN 890
750 M EX,EY)=M(EX,EY)+1000:EY=EY-1
760 M EX,EY)=M(EX,EY)+10:GOTO 900
770 IF EX+1=9 THEN 890
780 IF M(EX+1,EY)<>0 THEN 890
790 M(EX,EY)=M(EX,EY)+100:EX=EX+1
800 M(EX,EY)=M(EX,EY)+1:GOTO 900
810 IF EY+1=9 THEN 890
820 IF M(EX,EY+1)<>0 THEN 890
830 M(EX,EY)=M(EX,EY)+10:EY=EY+1
840 M(EX,EY)=M(EX,EY)+1000:GOTO 900
850 IF EX-1=0 THEN 890
860 IF M(EX-1,EY)<>0 THEN 890
870 M(EX,EY)=M(EX,EY)+1:EX=EX-1
880 M(EX,EY)=M(EX,EY)+100:GOTO 900
890 NEXT Z1
900 RETURN
910 'SET UP FM,RM,LM
920 IF M1=0 OR M1=9 OR M2=0 OR M2=9 THEN
                                FM=2:GOTO 1170
930 ED=M(M1,M2)
940 ON MD GOTO 950,1010,1060,1120
950 M2=M2-1
960 IF ED>=1000 THEN ED=ED-1000:FM=1 ELS
                                    E FM=0
970 IF ED>=100 THEN ED=ED-100:FM=1 ELSE
                                    FM=0
980 IF ED>=10 THEN ED=ED-10
990 IF ED=1 THEN LM=1 ELSE LM=0
1000 GOTO 1170
1010 M1=M1+1
1020 IF ED>=1000 THEN ED=ED-1000:LM=1 EL
                                    SE LM=0
1030 IF ED>=100 THEN ED=ED-100:FM=1 ELSE
                                    FM=0
1040 IF ED>=10 THEN RM=1 ELSE RM=0
1050 GOTO 1170
1060 M2=M2+1
```

```
1070 IF ED>=1000 THEN ED=ED-1000
1080 IF ED>=100 THEN ED=ED-100:LM=1 ELSE
                                    LM=0
1090 IF ED>=10 THEN ED=ED-10:FM=1 ELSE
                                    FM=0
1100 IF ED=1 THEN RM=1 ELSE RM=0
1110 GOTO 1170
1120 M1=M1-1
1130 IF ED>=1000 THEN ED=ED-1000:RM=1
                                ELSE RM=0
1140 IF ED>=100 THEN ED=ED-100
1150 IF ED>=10 THEN ED=ED-10:LM=1 ELSE
                                    LM=0
1160 IF ED=1 THEN FM=1 ELSE FM=0
1170 RETURN
1180 'GET MOVEMENT
1190 A$=INKEY$:IF A$="" THEN 1190
1200 IF A$=CHR$(94) OR A$=CHR$(10) OR A$
=CHR$(8) OR A$=CHR$(9) THEN 1210 ELSE
                                GOTO 1190
1210 IF A$=CHR$(94) THEN GOSUB 1270:GOTO
                                    1260
1220 IF A$=CHR$(10) THEN MD=MD+2
1230 IF A$=CHR$(8) THEN MD=MD+3
1240 IF A$=CHR$(9) THEN MD=MD+1
1250 IF MD>4 THEN MD=MD-4
1260 RETURN
1270 'MOVE
1280 IF MD=0 THEN 1330
1290 IF MD=1 THEN MY=MY-1:GOTO 1320
1300 IF MD=2 THEN MX=MX+1:GOTO 1320
1310 IF MD=3 THEN MY=MY+1 ELSE MX=MX-1
1320 IF MY=0 OR MY=9 OR MX=0 OR MX=9
                                THEN E=1
1330 RETURN
1340 'HEADINGS
1350 ON T GOTO 1370,1430,1480,1560,1580
1360 PMODE 1,1:SCREEN1,1:CLS
1370 PRINT@67,"M    M   AA  ZZZZZ EEEEE'
1380 PRINT@99,"MM  MM  A  A    Z   E'
1390 PRINT@131,"M MM M  AAAA   Z   EEEEE
                                    '
1400 PRINT@163,"M    M  A  A  Z    E'
1410 PRINT@195,"M    M  A  A ZZZZZ EEEEE

1420 T=2:GOTO 1580
1430 PRINT@291,"INSTRUCTIONS (Y OR N) ?"
1440 A$=INKEY$
1450 IF A$="Y" THEN CLS:T=3:GOTO 1470
1460 IF A$="N" THEN T=4 ELSE GOTO 1440
1470 GOTO 1580
1480 PRINT@96,"YOU ARE IN A MAZE";
1490 PRINT@130,"THE KEY ";CHR$(126);" CA
        N BE USED TO MOVE   FORWARD";
1500 PRINT@194,"THE OTHER CURSOR CONTROL
                                KEYS";
1510 PRINT@226,"ROTATE YOUR VIEW IN THE"
1520 PRINT@258,"APPROPRIATE DIRECTION";
1530 PRINT@322,"PRESS ANY KEY TO CONTINU
                                    E";
1540 A$=INKEY$:IF A$="" THEN 1540
1550 T=4:CLS:GOTO 1580
1560 PRINT@359,"GENERATING MAZE";:PRINT@
                        393,"PLEASE WAIT";
1570 T=5:GOTO 1580
1580 RETURN
```

Dragon Maze
by Howard Law

Rem patterns

on Spectrum

This program draws three patterns based on the same principle

Program notes

10-110	Draws the first pattern
120-141	Do you want a copy if you have a printer
150-240	Pattern 2
255-320	Pattern 3
330-340	The end of the prog

The Rem USR routine which is called in lines 150 250 and 1000 is as its name suggests a clear screen one

```
  1>REM Patterns © Sam Knowles

      14th April 1983

  5 LET a$="C O N I N G  U P  P
R T T E R N
                                  1".
GO SUB 1000
10 FOR f=0 TO 88 STEP .75
20 PLOT 15+(f*4),15: DRAW 85+f
  -(4*f),INT (144/22*f)+.5
30 PLOT 237-(f*4),15: DRAW (f*
  4)-88-f,INT (144/22*f)+.5
 40 NEXT f
 50 FOR f=1 TO 160 STEP 5
 60 PLOT f+0,f+0
 70 DRAW 255-f*1.5,0
 80 DRAW 0,175-f*2
 90 DRAW -255+f*1.5,0
100 DRAW 0,-175+f*2
110 NEXT f
115 GO SUB 120: GO TO 150
120 PRINT 00,"DO YOU REQUIRE A
    COPY ?"
130 PAUSE 0
140 IF INKEY$="Y" OR INKEY$="y"
THEN COPY
141 RETURN
150 LET cls=USR 3589
160 LET a$="C O N I N G  U P  P
A T T E R N
                                  2".
    GO SUB 1000
170 FOR f=1 TO 56 STEP 0
180 PLOT f+0,f+0
190 DRAW 255-f*4,0
200 DRAW 0,175-f*4
210 DRAW -255+f*4,0
220 DRAW 0,-175+f*4
230 NEXT f
240 GO SUB 120
250 LET cls=USR 3589
260 LET a$="C O N I N G  U P
    P R T T E R N
GO SUB 1000
280 FOR f=1 TO 159 STEP 9
270 PLOT f+0,f+0
280 DRAW 255-f*2,0
290 DRAW 0,175-f*2
300 DRAW -255+f*2,0
310 DRAW 0,-175+f*2
320 NEXT f
325 GO SUB 120
330 LET a$="T H E  E N D"
340 GO SUB 1000: STOP
1000 POKE 23693,6: BORDER 0
     LET cls=USR 3589
1010 FOR f=1 TO LEN a$
1020 FOR x=1 TO 10: FOR y=1
     TO 6: PRINT AT 7,6; INK
     y;a$: BEEP .01,y+x/3:
     NEXT y: NEXT x
1030 PAUSE 100: LET cls=USR
     3589: RETURN
```

Rem Patterns
by Sam Knowles

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EXHIBITORS Call Mike Johnston now on 01 861 9172 for details of space at this and future shows

Rabbit Blitz

on Vic20

This program is written for the unexpanded Vic20. The object of the game is to drop bombs, by pressing the space bar, to flatten the buildings and thus land safely. Once you've landed safely, you receive another screen.

You only have 30 bombs. The number of buildings destroyed is shown on the lower left of the screen, and the amount of bombs left is on the lower right.

Program notes

The reverse T's in lines 1-8 can be left out.

80-90	Sets up user defined graphics
100-230	Sets up the screen
1000-1121	Main loop
1950-2150	Crash routine
3000-3080	Dropping bomb
5000-5020	Landing routine

```
0 Z=10 M1=254 POKE36878,15 POKE36879 8
1 REM'[illegible]
2 REM"[illegible]
3 REM"[illegible]
4 REM"[illegible]   RABBIT   *
5 REM"[illegible]    BLITZ   *
6 REM"[illegible]            *
7 REM"[illegible]
8 REM"[illegible]
9 PRINT"[illegible]   RABBIT BLITZ!!" PRINT'
   [illegible] 5% [illegible] INUH'
10 PRINT"[illegible]PLEASE WAIT"
20 FORI=0TO501 POKE7168+I PEEK 32768+I NEXT
30 FORT=0TO47 READD POKE7168+T D NEXT
40 DATA255,255,219,219,255,255,219,219
50 DATA16,24,156,255,255,156,24,16
60 DATA60,60,24,60,60,60,60,24
70 DATA255,255,255,255,255,255,255,255
80 DATA0,0,0,0,0,0,0,0
90 DATA0,0,0,0,24,60,126,255
100 PRINT"[illegible]" Z=Z-1 POKE36869,255 B=0 POKE
    650,127 POKE36879,25 IFSC=10THEN5000
110 FORT=8120TO8185 POKET 3 POKE30720+T 5
    NEXT
120 A$ [illegible]
    [illegible]"
125 A$ [illegible]
    [illegible]"
130 A$ [illegible]
135 A$ [illegible]
140 FORT=0TO[illegible]
150 PRINT"[illegible]TAB T  A$ INT(RND(1 *6 +[illegible]
160 NEXT
200 POKE7680+Q 1 POKE7680+30720+Q 1
210 FORR=1TO[illegible] NEXTR PRINT'[illegible]
    [illegible]'[illegible]
212 GETA$ IFA$=  'THENGOSUB3000
213 IFPEEK 7680+Q+1 =SCRPEEK 7680+Q+1 =
    THEN1998
214 IFPEEK 7680+Q+22 =SCRPEEK[illegible]
    GOTO 80
215 IFA$='N'THENGOSUB7000
216 POKE7680+Q 4 Q=Q+1
```

```
1110 POKE36877 245
1120 GOTO1000
1998 POKE36877 150 FORT=1TO10 POKE36865,50
     FOR [illegible] NEXTT POKE36865 40
1999 FORX=1TO50 NEXT X NEXTT POKE36877 0 PRINT
     "[illegible]
2150 POKE36869 240 GOTO5030
3000 IFB=30THENRETURN
3005 FORT=7680+QTO8113STEP22
3010 POKET [illegible] POKET+30720 2 POKE36874 M1
3030 FORP=1TO10 NEXTP
3040 POKET 4 M1=M1-2
3050 IFPEEK T+22 =0ANDPEEK(T+44)=SCTHEN
     TB=TB+1
3051 IFPEEK T+22 =SCTHENPOKE36877 130
3060 NEXTT B=B+INT RND(1)*3) B=B+1 M1=254
     [illegible]
     TURN
5000 PRINT"[illegible]" POKE36869 240 POKE36877 0
5010 PRINT'[illegible]ELL DONE YOU VE'
5020 PRINT'[illegible]LANDED PERFECTLY
5030 PRINT'[illegible]YOU LANDED "SC"TIMES"
5032 PRINT'[illegible]YOU DESTROYED"TB PRINT'
     3UILDINGS!!'
5035 GOSUB 10000
5040 PRINT" ANOTHER GAME
5050 GETA$ IFA$='Y'THENRUN
5060 IFA$='N'THENPRINT'[illegible]' END
5070 GOTO5050
7000 POKE36877 0 POKE36874 0 POKE.33,0
     [illegible]
7010 POKE36877,245
7011 RETURN
10000 FORT=0TO255STEP22 POKE36879 T FORB=
      1TO100 [illegible] RETURN
```

Rabbit Blitz
by C Simon

Shopkeeper

on ZX81

As every small shopkeeper knows, one of the hardest things to keep up with are the costs of the things (s)he has in stock — this program sorts all that out.

Unfortunately it can only take 20 stocks as it stands, but this can be easily remedied by adding a scroll in line 195.

```
5 REM COSTS
10 PRINT"NO. ITEMS STOCKED(MAX20)="
20 INPUT N
30 PRINT
40 PRINT"COST PRICE OF 1 ITEM (P)="
50 INPUT C
60 PRINT
70 PRINT"PERCENT PROF. MARGIN REQ="
80 INPUT P
90 PRINT
100 PRINT"PERCENT RATE OF V.A.T. ="
110 INPUT R
120 CLS
130 PRINT"NO.    C.P.    S.P    S.P.+VAT"
140 FOR X=1 TO N
150 LET A=X*C
160 LET B=A+(P/100*A)
170 LET D=R/100*B
180 LET E=B+D
190 PRINTX;"    ";A;"    ";B;"  ";E
200 NEXT X
```

Shopkeeper
by M Valentine

Tough adventuring

What do dark glasses a native woman and a little slimy green man have in common? No, it s not a new video for Top of the Pops! They all crop up along with many other frustrating and annoying problems in Artic s adventures for the Sinclair ZX81 and Spectrum

As I ve said before these are extremely tough adventures to crack although Clive Petry dismissed *Planet of Death* rather disdainfully having completed it in a matter of a few hours! Incidentally Clive the other adventures from Artic are pretty much the same so you might find them disappointing too It is also true that you need a Password to enter the insanity of *Pimania* but you shouldn t have too much difficulty with it — just keep the name in mind and it should be obvious

Back at Artic and the one that seems to give the most problems is *Planet of Death*

One of the locations that puzzles people is the force field — at this point you should have the laser gun and of course everybody fires at it, with little success Unfortunately, Artic requires you to fire *twice* at the force field Then, as you may deduce from the clue which answers your plea for *Help*, you must dance to the music from the transistor radio

This illustrates a technique that you must be prepared to use when playing computer-moderated adventures — if things aren t working use every command twice and than three times if necessary

Mark Warnock of Dingwall is stuck at the force field but also would like to know how to get at the coin in the lake Don t bother Mark — it s a Red Herring (as is the computer later on)! And yes you can get the mirror that the green man is sleeping on — just wear the gloves, *Get* the man then *Kill* the man

As to Barnaby Smith s question regarding the maze — well Barnaby, it s not impossible to get out of the maze In fact, you will need to go through the maze to complete the game But, I will leave you to find the right direction — the only clue you can have is that each direction has to be tried once only

Finally as far as *Planet of Death* is concerned I have received a complete solution from Chris Jones — anyone who would like a copy, just send me a large SAE and I ll return a copy of the map

On to Adventure B now which is also known as *Inca Curse* or *Inca Treasure* (Artic uses both names) One of the problems that gives trouble here is the *Fire Room* and, more specifically how to put out the fire Here you will need the magic blanket then it is up to you to decide how to extinguish the fire with it

Ship of Doom has its fair share of problems too one of which is the specs puzzle To get the micro battery the player needs to *Wear* the specs — many people have complained however that the program crashes if the instruction is typed in, and wonder if it is a bug I would say that it is most definitely a bug and Artic should replace your tape if you have this trouble

Espionage Island is the fourth Artic adventure I don t have personal experience of this one, so I can only go by Artic s Help Sheet (which, as I ve said before they will supply to any adventurer who writes asking for one) First of all, to get out of the wreckage you will need the Parachute Then you are on your own

The native woman, apparently is there to be given the beads that you will find in the aircraft wreckage — and that I believe is all you ll find in the wreckage And you will have to *Feed* about the wreckage to get those!

The tank is an obstacle that some of you have trouble with and this is a complicated one to explain First you must *Switch Switch* then *Remove Light* and *Insert Plastic* There are still a couple of actions to get through *before* successfully completing the manoeuvre

The latest adventure to be released by Artic only a few weeks ago at the Earl s Court Fair, is *The Golden Apple* which is a bit of a diversion for Artic being rather more colourful than the previous games

Michael Fuller of Bromley, has kindly sent me a tip about the game — first of all don t *Quit* as the program says you should in order to *Save* the game all you need do is *Save* or *Load* as appropriate

Finally this week to the BBC machine which I ve shamefully neglected of late I have had a couple of letters answering the plea for help in *Castle of Riddles* R Adams, of Bury, says that to get through the maze you should wave the black rod This has an unusual effect and should give you an idea of what to do next which in turn should give you a clue as to the Password which you will need at the end of the maze In the corridor of doom he says that you should travel straight down and do nothing else otherwise you re a goner!

Now he in turn would like *Help* being well and truly stuck at the end of the Shooting Gallery — can you help him?

David Swain also sends a solution for this part of the adventure it is rather complex and we are running out of room so as with Artic s *Planet of Death* I think that I will send out copies of his letter (which he has agreed to) to anyone sending me a large SAE c/o the magazine ■

This series of articles is designed for novice and experienced Adventurers alike Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter So if you have an Adventure you want reviewed or if you are stuck in an Adventure and cannot progress any further write to Tony Bridge Adventure Corner *Popular Computing Weekly* 12-13 Little Newport Street London WC2R 3LD

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This competition is designed just for young people — you must be aged under 18 on September 1 1983 in order to enter

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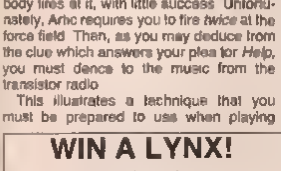

Rules

(1) Each entry must consist of a 1 000 word essay preferably typed double spaced on one side of the paper only together with a completed entry form
(2) All entrants must be aged under 18 on September 1 1983
(3) Closing date for competition entries is September 1 1983
(4) The judges decision is final
(5) No employees of Sunshine Publications Ltd or their families will be eligible to enter

LYNX COMPETITION

Name

Address

Age

Date of birth

Tel No

HEADER CODE

V Stevens from the General Hospital Nottingham writes

Q I own a Spectrum and my problem is this I have *Saved* a long program from a book, but in a moment of hypoglycaemia, I have wiped out the 17 byte header *code*. Is there any way of reclaiming the program, or do I have to start again?

A Once again we come back to Ian Logan's book of the Spectrum Rom (published by Melbourne House) The only way that you can possibly get out of this, as far as I can see, is to write your own header and use that

You would have to write a machine code version of the header giving the length of the program This would mean that you would have to estimate the length of the program (be generous on this) Next you should *Load* the tape into a block of memory If the block is not long enough then you will lose the balance of the program or even the program itself If you have too large a block then you will have some rubbish on the end that will need editing out

PRINTER RIBBON

Ian Anderson of the Universal Micro Club Corbs Nothants writes

Q Our club has recently been given a Nascom Micro Imp printer However, we have been unable to get hold of a printer ribbon Could you, or one of your readers, help us

A I have drawn a blank I am afraid I asked at several shops and contacted a couple of manufacturers but without success Nascom was taken over by Lucas but they do not seem to have any printer ribbons either

The best suggestion I can offer if one of our readers cannot help you is that you try and contact a good stationers or a wholesaler who might have a retail counter Printer and typewriter ribbons and cartridges are all classed into groups You will need to find out which group your ribbon falls into if you are to have any chance of tracking down an alternative

I know from hunting out a ribbon for an old typewriter of mine, that at least some ribbons are made that are a compromise between several groups If you take your spool to a dealer then, with luck, they will at least be able to tell you its group number — from there at least you will know what you are looking for

The only other thing that I can suggest is that you try the long and somewhat mucky task of re-inking the ribbon Apparently it has been done though the first batch of copies will have to be done on thick absorbent paper

The ribbon on the Imp is, I believe, a standard ½-inch black which should make your task easier

SPECTRUM MISTAKE

T Ahs of Clarkewell Road, Hillhouse, Hamilton Lanarkshire writes

Q I had to send my Spectrum away for repairs and have just received it back after about three weeks. I found that they have sent me back an issue 2 Spectrum, instead of the issue two that I had previously.

I have several things that I would like to ask *(a)* Can any program, including machine code, recorded on the issue 2, be *loaded* by the issue 1 (I could not find out because they forgot to return the aerial lead)? *(b)* Will the printer or microdrive be able to work with the issue 1? *(c)*. Is it possible to connect the Zeaker Micro-turtle to the issue 1? *(d)* Will any other peripherals made for the Spectrum be able to work with the issue 1, as I was also thinking of joining the Micranet 800 service?

A This mistake is not unique — I wonder how many times it has happened If your computer is 48K then you will probably not meet many problems If it is 16K then I would advise you to send it back, because it is getting difficult to get upgrades though these are supplied by Sinclair

In fact, you should find no problems with any of the points you raise the main internal difference is the new transistor arrangement around the ULA

TUNED ZX81

John Adams of Tivoli Road Hounslow, writes

Q I am the owner of a ZX81 with 16K Ram. When I finish using my computer, I turn it off, but leave the computer plugged into the television. But, when I turn it on again, it is not tuned in as well as it was. I always manage to re-tune the computer, but is this a fault in the modulator?

A I am still getting a fair few ZX81 questions so a quick re-cap of the common ones will be useful for quite a few people

The ZX81 does not have the best possible tuning — the slightest fluctuation can cause the tuning to slip Your modulator is part of the problem but there is nothing to worry about as it is something that happens on many computers

Related to this is the fact that the top of the screen display will start to slant, A C Wayte of Derby, Paul Belling of Stranraer, and Shelly Goodman of Grimsby have all asked about this It is the first sign of overheating but at this rate every ZX81 I have come across over-heats If you get no other problems, then it is one of the harmless quirks that ZX owners have learned to ignore

Alasdair McMillan of Great Ayton and D C Ingham both want to know how much memory they have left in their programs while G D Fenner of Norwich wants to find out how much room his programs take up This has to be done by looking at the systems variables — taking the value at the start of the program from the value at the end will give the amount of memory used Taking the end of the program from Ramtop will tell you how much space you have left The following three lines should give you a good idea of the situation in the memory depending on what you are looking for You can enter them as direct commands while you are entering a program

```
PRINT PEEK 16396 + 256 *PEEK
16397 - 16509
```

This will give you just the number of the bytes in the program, and it ignores anything else including variables

```
PRINT PEEK 16404 + 256 *PEEK
16405 - 16384
```

This will give you the number of bytes occupied by the systems variable variables program, and the screen

```
PRINT PEEK 16396  PEEK 16412 +
256 * (PEEK 16397 - PEEK 16413) -
80
```

BBC CHECK

Andy Young of Mayfields Road Colchester writes

Q I have just bought a BBC 'B' from a friend, and I am very pleased with it. But it does not have a *Verify* command My cassette player is a bit temperamental, so I wondered if there was any way to simulate this command, so that I could check programs had been *Saved*

A Probably the best way to get round this is with the command *cat This checks for a tape *loading* error Obviously if one is shown then it will be a case of re-saving But as for a system whereby you can actually check the program on tape against the one on your computer, I am afraid that I do not know of one

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can The address is *Peek & Poke, PCW*, 12-13 Little Newport Street, London WC2R 3LD

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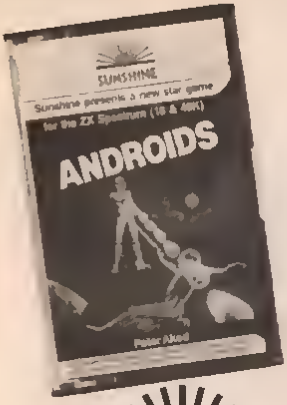

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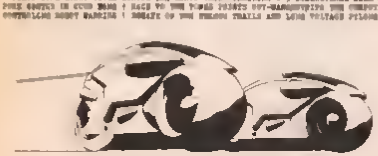

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Supplier *Kenema Associates*
1 Marlborough Drive
Worle
Avon BS22 0DQ

ADAPTABLE

Mentor Software appears to be hedging its bets with its latest release

Scrambler 2 is an educational program to teach various subjects and is being sold in two versions, one for the BBC and one for the Spectrum

The program is claimed to be infinitely adaptable so that it can teach an 18-year-old chemistry or a six-year-old spelling The package is aimed at teachers and has an accompanying manual of over 40 pages

Program *Scrambler 2*
Price *£11 49*
Micro *BBC/Spectrum*
Supplier *Mentor Software*
The Paddock
73 Oldfield Road
Stannington
Sheffield S6 6DU

BARRELS

All the features of the arcade version are promised in *Krazy Kong* from Rainbow Software

The aim of the game is to rescue a helpless girl from the clutches of the famous Hollywood Gorilla — this is difficult because he is chucking barrels at you as you ascend a rather precarious series of ladders to reach him

The game requires 16K and is the first release by Rainbow

Program *Krazy Kong*
Price *£5*
Micro *Jupiter Ace*
Supplier *Rainbow*
5 Turnham Green
Penylan
Cardiff CF3 7DL

BLAST BOMB

Vectis Software is a new software company based in the Isle of Wight The company has just released four tapes, two for the Spectrum and two for the Vic20

Death Maze of Mandragon is the evocative title of a fairly unusual sounding game for the unexpanded Vic

You must find your way through a maze which unfolds before you There are various secret passages as well as matter transmitters which beam you randomly to another part of the maze

All the while you are being chased by a monster Your one chance of escape is a single blast bomb which detonates three seconds after it is dropped, giving you a few brief seconds to find the exit

Program *Death Maze of Mandragon*
Price *£4 95*
Micro *Vic20*
Supplier *Vectis Software*
6 Victoria Road
Sandown
Isle of Wight
PO36 8AP

SERIOUS

It seems that the building industry is constantly having to work out stresses and strains for timber and steel 'Ahha' you say "You could write a computer program to do that and sell it for a lot of money"

Forget it Tectonic Software has already done it Its two programs *Steel Calc* and *Timber Calc* calculate loadings and spans for various kinds of beam

It's obviously intended for a serious user and consequently comes at a serious price — £19 95 each

Program *Steel/Timber Calc*
Price *£19 95*
Micro *Spectrum 48K*
Supplier *Tectonic Software*
PO Box 100
Poole
Dorset BH17 9BH

SACRILEGE!

Pity the poor child of a BBC owning father (or mother), pleading to be allowed to wipe out the alien hoards, but instead forced to learn how to tell the time, spell or recognise numbers

This is because unlike lesser micros and despite a great graphics facility, the BBC is a serious micro — so serious in fact that it is almost sacrilege to play games at all (well maybe chess) on it

Still the educational software for the BBC has to be that much better because of the competition — which leads us in an indirect way to Bourne Educational Software and its *Timeman One* program, which teaches children to tell the time, designed, of course, for the BBC B

Program *Timeman One*
Price *£8 97*
Micro *BBC B*
Supplier *Bourne Educational Software*
Bedfield Lane
Headbourne Worthy
Winchester
Hants SO23 7SQ

WINGED

Company name of the week goes to Megadodo Software which has just issued a program for the Spectrum called *Pheenix*

Pheenix, you will not be surprised to learn, is a version of *Phoenix* sometimes known as *Cosmic Firebirds* Anyway it involves shooting the wings of birds with your deadly laser cannon, fighting your way through to the final confrontation with the mothership

The game has all five screens of the original and is, as is virtually mandatory these days, written in machine code

Program *Pheenix*
Price *£5 90*
Micro *Spectrum 16/48K*
Supplier *Megadodo Software*
16 White Road
Sutton Coldfield
West Midlands
B72 1ND

BLASTED!

Space Hi-Way is a new arcade style game for the BBC B

You see alien raiders in the distance on the hi-way which drop off to attack your fuel reserves You, needless to say, don't want them to do so and without so much as a diplomatic move, start blasting

Game features include variable strength laser blasts and mutating aliens

Program *Space Hi Way*
Price *£8 57*
Micro *BBC B*
Supplier *Amcom*
23 Hivings Hill
Chesham
Bucks HP5 2PG

SNOOPER

Two utility programs for the price of one come from GL Software *3D Graphic Generator* enables you to create various designs using the cursor keys on your Spectrum

The other program is called *Super Snooper* and it will copy machine code programs — which is fine, providing they are your own

Program *3D Graphic Generator*
Price *£3 99*
Micro *Spectrum 16/48K*
Supplier *GL Software*
Wyndhurst
Bleak Hill Rd
Windle
St Helens
Merseyside

BEAMED UP

A version of *Star Trek* that isn't a version of *Star Trek*, But is a version of *Star Trek?*

Beam me up Scotty has a number of the features of the classic tv program, but none of the features of the rather old hat computer game

The plot concerns the Starship Enterprise Your task is to beam down to fetch some more dilithium crystals Unfortunately the planet you arrive on comes complete with man-eating alien monsters and other obstacles

Program *Beam Me Up Scotty*
Price *£5 95*
Micro *BBC A or B (32K)*
Supplier *Futura Software*
63 Lady Lane
Chelmsford
Essex CM2 0TO

ORIGINAL

Surprisingly enough, *Robot Panic* has very little to do with *Apple Panic*; it is even possible it is almost a totally original idea

You have to prevent the various bugs, common to all space games, from infesting your cargo hold Naturally, this involves killing them

Time is short, because two giant steel doors are slowly closing If you haven't managed to kill all the bugs before the doors close, not only will you not be able to get onto the next level of bugs but you will also be killed Life is hard

Program *Robot Panic*
Price *£4 95*
Micro *Spectrum 16/48K*
Supplier *Soft Mill*
20 Station Road
Haddenham
Ely
Cambs CB6 3XD

MACHINE CODE

Personal Software Services seems to be trying to have something for every micro under the sun

This month it is concentrating on the Oric with the release of five arcade games and a machine code monitor/disassembler *Oricmon*

Oricmon includes a full 6502 disassembler, along with various memory display and modification commands The program's main features are indicated in a leaflet that comes with the cassette, but you will have to be fairly knowledgeable in machine code to get the most from it

Program *Oricmon*
Price *£5 95*
Micro *Oric 48K*
Supplier *Personal Software Services*
452 Stoney Stanton Road
Coventry CV6 5DG

★★★★★★★★★★★★★★★★

COMING SOON

Tansoft is soon to release a number of programs for Oric owners Although some of these sound like fairly serious packages, there is at least one game — *Ultima Zone*

Oric CAD is the Oric equivalent of *Vu 3D* on the Spectrum, ie, it enables you to construct 3D figures and move them around on the screen — price around £9 00

Oric Calc is the equivalent of *Vu-File*, but comes with a manual at about £15 00 There is also a language course using the Grunebeg linkwork method of learning — no, I've never heard of it either

And so to *Ultima Zone* This is a three-part 100 per cent machine code game that's supposed to be a mixture of just about everything you've ever played It's expected to retail for £7 95

Silversoft has several new games for the Spectrum *Armageddon* is a version of missile defence in which you must prevent your cities from being destroyed by continuous attack waves

Of less obvious parentage is something called *Brain Damage* — here you are patrolling the circuits of a master computer in a proton-panzer, you must fight off various electron panzers or find the hyper gate to another circuit

New Releases is designed to let people know what software is coming on to the market If you have a new game or utility which you are about to release send a copy and accompanying details to New Releases Popular Computing Weekly 12-13 Little Newport Street London WC2R 3LD

Ziggurat

Machine IQ?

"There is no security against the ultimate development of mechanical consciousness in the fact of machines possessing little consciousness Reflect upon the extraordinary advance which machines have made during the last few hundred years and note how slowly the animal and vegetable kingdoms are advancing *The Book of the Machines* translated by S Butler

I have recently been reading a powerful polemic, arguing — in the baldest terms — that machines will become more intelligent than humans and therefore the development of further advanced machines should be stopped

Personally, I find the argument rather unconvincing In some areas, but it has more than a grain of truth

The reasoning starts with the question of consciousness To be intelligent one needs to be conscious — and the author (name not given) asks where one can draw the line between the animate and inanimate He says

The shell of a hen s egg is made of delicate white ware and is a machine as much as an egg cup is the hen makes the shell in her inside but it is pure pottery Then he asks whether an insect-eating plant has consciousness or not.

If Man has consciousness and plants (plus many animals) are not conscious then the race of man has descended from things which had no conscious at all He thinks that even if present machines are not conscious (ie, self-aware) the does not rule out a future generation of conscious and therefore intelligent machines

present machines are to the future as the early Saurians [dinosaurs etc] are to man The largest of them will probably greatly diminish in size as Man is far smaller than many of the prehistoric monsters

The author does not fear the existing machines "What I fear is the extraordinary rapidity with which they are becoming something very different to what they are at present No class of beings have in any time past made so rapid a movement forward

He feels that a jealous watch should be kept on that movement, ready to hell it if necessary Man only appears to be the master and the machine the servant The servant glides by imperceptible approaches into the master and we have come to such a pass that even now man must suffer terribly on ceasing to benefit the machines In other words without machines humanity would be extinct within six months

From a purely materialistic point of view the writer agrees that those who thrive best are those who use machinery wherever its use is possible with profit. This is the art of the machines he says they serve that they might rule and he actually imputes consciousness to machines Man s decline has come because of his growing preference for his material over his spiritual interests

Douglas R Hofstadter (in *Godel Escher Bach*) also thinks that the concept of consciousness is very important and he does not see why it cannot be applied to machines To answer the question What is consciousness? Hofstadter says we need to unravel "the nature of the isomorphism which underlies meaning and in his final chapter he effectively argues for machine consciousness (though possibly still in the future)

F H George (in *Man the Machine*) examines the reproductive potential of machines (robot sex?) and he might have himself read *The Book of the Machines* because in that work there is an extended discussion of the nature of machine reproduction *The* unknown author writes "Very few creatures reproduce after their own kind They reproduce something which has the potentiality of becoming that which their parents were And he gives the example of the butterfly in time might machines be the same?

Okay, okay I have to come clean! The books by Hofstadter and George are recent books about artificial intelligence *The Book of the Machines* is three chapters from the novel *Erewhon* by Samuel Butler written over 100 years ago in 1872.

In *Erewhon* there was a revolution against machines ■

Boris Allen

Puzzle

Card sharp

Puzzle No 68

In an air conditioned room The Demonstrator separated out the club suit from an ancient pack of Earth playing cards Mechanically the 13 cards were shuffled and six were dealt on to the ivory surface in two rows of three "Using my telepathic powers I will communicate the values of the cards to you

To help The Watchers tune-in the top left hand card was exposed *The five* Adding the top three cards together gives the same total as adding the bottom three Multiplying the top three together gives the same total as multiplying the bottom three (Ace = 1 Jack = 11, Queen = 12 King = 13)

You too can see inside The Demonstrator's mind and find the cards What are they?

Solution to Puzzle No 63

The program calculates how far the ball has travelled by summing each bounce continuing until the difference between the distances travelled on successive bounces is too small to measure It is intriguing but irrelevant that, as one reader pointed out, on the 400th bounce the ball travels 1 7 × 10 − 37 ft

```
10 LET D = 8 : 20 LET S = 0 : 30 LET F = 0 : 40 LET
T = D : 50 IF S = THEN GOTO 150 : 60 LET S = D : 70
LET D = D * F : 80 LET T = T + 2 * D : 90 GOTO 50 : 100
PRINT "TOTAL DISTANCE = ";T " FEET"
```

An alternative approach is that the total distance travelled is twice (the ball is bouncing up and down) the sum of a simple geometric progression

Distance = 2 × initial height/(1 − ratio of bounce to the next)

= 2 × 250/(1 − 0 8)

= 500/0 2

Using both methods the answer is 2,250 feet. No cookies for David Poole who said "The ball will continue to bounce indefinitely The dog soon got bored watching the ball rushed over to it, grabbed the ball in its mouth and was last seen running out of the factory, being chased by the managing director Thanks David

Winner of Puzzle No 63

The winner is P Amey St Marys Road Long Ditton Surrey who claims ownership of Amey s Law and wins £10 Amey s Law If a ball is dropped from a given height and if it only bounces each time to 80 percent of the preceding bounce then it will have travelled nine times the original height before coming to rest. He suspects the law is completely useless

Top 10

Vic20

1	(3)	Arcadia	(Imagine)
2	(2)	Wacky Waiters	(Imagine)
3	(6)	Pacic	(Bug-Byte)
4	(5)	Asteroids	(Bug-Byte)
5	(4)	Cosmoids	(Bug-Byte)
6	(1)	Ceiling Spacing	(Imagine)
7	(—)	Laser Zone	(Llamasoft)
8	(—)	Gold Runner	(Llamasoft)
9	(8)	Alien Blitz	(Audiogenic)
10	(—)	Mutra	(Llamasoft)

(Figures compiled by Boots & Co London)

Top 10

Spectrum

1	(1)	Jet Pac	(Ultimate)
2	(3)	Transylvanian Tower	(Richard Shepherd)
3	(2)	Flight Simulation	(Psion)*
4	(4)	Heroes Gives Swing	(Psion Melbourne House)
5	(6)	Heroes and the Spiders	(Psion Melbourne Heroes)
6	(7)	Monsters in Hell	(Softek)
7	(10)	Reflexes	(Melbourne House)*
8	(—)	Psion	(Ultimate)
9	(5)	3D Tank	(DK Tronics)
10	(—)	Mind Martha	(Mikrogen)

*Requires 48K

(Figures compiled by W H Smith & Sons)

Top 10

Atari

1	(—)	Ultima II	(Beers On-Line)§
2	(5)	Suspended	(Infocom)§
3	(—)	Grid Runner	(Llamasoft)
4	(—)	The Bears of Blackpoole	(Sirius)§
5	(10)	Assault	(English)
6	(6)	Zaxxon	(Datasoft)
7	(7)	Preppie 2	(Adventure International)
8	(—)	Blue Max	(Synapse)
9	(—)	Orc Attack	(Thorn EMI)
10	(—)	Mole 2048er	(Big Five)

Cartridge (32K cassette, 64K disc

(Figures compiled by Celebs Computers Birmingham 021-632 6458)

Top 10

Dragon 32

1	(1)	Meteorites	(Dragon Data)
2	(2)	Basic Tutorial	(Amaysoft)
3	(3)	Personal Finance	(Dragon Data)
4	(4)	Special Collection 1	(Dragon Data)
5	(5)	The King	(Microdeal)
6	(8)	Space War	(Microdeal)
7	(6)	Talking Android Aliens	(Microdeal)
8	(9)	Night Flight	(Salamander)
9	(7)	Planet Invasion	(Microdeal)
10	(—)	Caterpillar Attack	(Microdeal)

(Figures compiled by Boots & Co London)

BBC*

1	(2)	Starship Command	(Acornsoft)
2	(—)	Countdown to Doom	(Acornsoft)
3	(5)	Missile Base	(Acornsoft)
4	(—)	Swoop	(Program Power)
5	(1)	Snooker	(Acornsoft)
6	(—)	Chess	(Program Power)
7	(—)	File II	(Micro Management)†
8	(4)	Killer Gorilla	(Program Power)
9	(—)	Mailing List	(Micro Management)†
10	(7)	Great Britain Limited	(Simon W Hessel)

Model B only †Disc

(Figures compiled by Micro Management Ipswich 0473 56181)

ZX81*

1	(2)	Football Manager	(Addictive Games)
2	(3)	Defender	(Quicksilva)
3	(8)	Flight Simulation	(Psion)
4	(1)	Off Shoreline	(Quicksilva)
5	(6)	1K Games	(Artic)†
6	(8)	1K Chess	(Artic)†
7	(7)	Fantasy Games	(Psion)
8	(—)	Space Raiders	(Psion)
9	(—)	Planet of Death	(Artic)
10	(9)	Espionage Island	(Artic)

*All 16K Model where stated †Runs in 1K

(Figures compiled by Boots & Co London)

Books

1	(1)	Commodore 64 Programmer s Reference Guide	*Commodore* (Commodore)
2	(—)	Spectrum Hardware Manual	*Dickens* (Melbourne House)
3	(2)	Structured Programming with BBC Basic	*Atherton* (Newnes)
4	(6)	Complete Spectrum Rom Disassembly	*Logan* (Melbourne House)
5	(—)	Complete Earth, Wonder	(Sigma)
6	(4)	6502 Machine-code For Beginners	*Stephenson* (Newnes)
7	(8)	Vic20 Programmer s Reference Guide	*Commodore* (Commodore)
8	(—)	Spectrum Machine Language for the Absolute Beginner	*Tang* (Melbourne House)
9	(—)	Z80 Assembly Language Programming	*Leventhal* (Osborne)
10	(—)	Programming the 6502	*Zaks* (Sybex)

(Figures compiled by Watford Technical Books Watford 0923 23324)

(Last week s position in brackets)

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